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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

OCTOBER 21.
Sheffield Metallurgical Association:—Ordinary meeting at Sheffield. Discussion on "Forging Troubles of Special Steels," introduced by H. Etchells.

OCTOBER 28.
Institute of Metals (Swansea Local Section):—Ordinary meeting. "Impurities in Copper," Paper by Dr. Rosenhain.

OCTOBER 29.
British Cast Iron Research Association:—Annual meeting and luncheon.

Institute of British Foundrymen.

OCTOBER 18.
Lancashire Branch (Junior Section):—Opening meeting at Manchester. Presidential address by Mr. H. V. Grundy. Paper on "Wheel Moulding," by R. Yeoman.

OCTOBER 25.
Newcastle and District Branch:—Ordinary meeting. "The Production of Large and Medium-sized High-class Iron Castings," Paper by W. Scott.
Birmingham, Coventry and West Midlands Branch:—Ordinary meeting. "Foundry Theory and Practice in America," Paper by J. G. Pearce, M.Sc.

A Useful Pointer.

All business men are aware of the value of an index to the state of trade. Thus, if trade is generally declining, business men in the same line of activity would expect to be equally affected by the factors outside their control, so that they would expect their fluctuations to be represented by the index. Similarly, they would expect to share in improving trade conditions to the extent indicated by the index, and, if they do not, would be wise to examine the causes thereof. Any slump in a business or sudden expansion not reflected by the index would necessitate explanations, and so on. We have from time to time in our columns indicated the volume of activity in the equipment side of the trade, which is in itself a good pointer to the activity or pending activity of the trade as a whole.

We learned recently that the Bank of England is now co-operating with a group of 100 large departmental stores in 60 great towns in Great Britain. Every month each stores makes a return for the month and the corresponding month last year covering sales made, stocks held and workpeople employed. The individual returns are, of course, treated as strictly secret. For analytical purposes the country is divided into five sections, and the returns into ten departmental headings, according to the type of merchandise sold. The results will yield what may be called a retail trade index which will show the short-term fluctuations of business and also the long-term changes, such as the steady improvement which would normally be expected in business.

This scheme should serve as an example to the founding industry. It is of great importance to many people in the trade and of those in the supply and equipment section to know whether trade is going up or down, because business commitments are always made ahead and depend largely on improvement or downward fluctuation. Furthermore, it would be possible to indicate the precise effect, of which we are at present ignorant, of changes such as that due to the use of fabricated steel, or of the wider use of cast iron in engine construction (such as the increased development of the oil engine) or in the building trades.

Such a scheme could only be formulated—and its formulation could readily be made—if the large majority of firms concerned were prepared to send the necessary returns. The results would show them how far their own fluctuations were due to causes within their control and how far to external causes. Furthermore, it is well known that it is ignorance of these changes which heightens the peak and lowers the trough of the curve of business fluctuation, so that knowledge of what is coming, so to speak, enables the change to be discounted in advance. Thus panic buying of raw material in time of shortage would be arrested, prices would be kept down, selling prices would respond and the whole cycle that leads to a market collapse and a slump would tend to be avoided.

In Conclusion. . . .

"Riley," in the correspondence columns, expresses a strong desire that the commercial end of the semi-steel problem should be resolved without loss of time. He postulates that 15 per cent. steel should be accepted as a minimum, but he ignores the constitution of the other 85 per cent. of the charge. This obviously may consist of any high-carbonferrous material ranging from genuine cold-blast iron, hematite, good machinery scrap to rusty rain-water goods. Thus we can establish immediately that in any attempt at standardisation some reference must be made to the full constitution of the charge. Moreover, it must be borne in mind that there is more so-called "semi-steel" sold as ordinary grey iron castings than material actually carrying that particular description.

There is something mean about the term semi-steel, because to the man-in-the-street steel has an honourable significance denoting reliability, strength, elasticity, and so on. Thus the use of the term semi-steel is poaching upon the good name of steel. Conversely, cast iron is regarded by non-discriminating buyers as something cheap and possessing poor mechanical strength. Thus founders, making and marketing a material showing better qualities than ordinary cast iron, but still possessing no elasticity, should create a suitable name or trade-mark by which engineers and users are able to discriminate between common grey iron and a superior product which carries improved tensile, transverse, and shock-resisting strengths, and maybe other qualities, such as increased resistance to wear, "growth", and corrosion.

Until manufacturers of semi-steel can put before the engineering and metallurgical worlds a more scientific story, we cannot help them to formulate a case to place before the British Engineering Standards Association, the governing body for such matters. Semi-steel has been made since the birth of cast iron. Its existence cannot be proved by chemical analysis, mechanical tests or microscopic investigation. Its properties (whatever they may be) can be reproduced by alternative means. Our last and final suggestion is that founders should regard steel as a normal constituent of their cupola charges, which is to play its part just like refined iron, hematite or any other ferrous product. The logic of semi-steel castings is such that, if extended, one could envisage "cold blast," "refined," or other castings on the market, because from 0.1 to 15 per cent. of these materials in the form of pig-iron had been added to the original charge.

XUM

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Semi-Steel.

To the Editor of The Foundry Trade Journal.

Sir,—Half a ton of molten mild steel added to a ladle containing half a ton of molten iron makes one ton of semi-steel, the composition and quality of which will depend upon the nature of the iron used. On the other hand, half a ton of mild steel melted in a cupola together with half a ton of iron makes rather less than one ton of "semi-steel," the composition and quality of which will depend upon the nature of the iron used and the cupola practice. The latter proposition is the one before us, because the bliss of ignorance labels it "semi-steel" and the light of knowledge cannot alter it. However, if a cupola mixture containing 15 per cent. of steel gives "semi-steel," so also does one containing 10 per cent., or 5 per cent., or even 0.0446 per cent., which last quality being made by adding 1 lb. of steel to every 1 ton of iron charged.

One foundry may mix 5 cwts. of mild steel with 15 cwts. of iron containing 4 per cent. silicon and 1.6 per cent. phosphorus, getting a cast iron containing about 2.7 per cent. silicon and 1.2 per cent. phosphorus; whilst another foundry using in the mixture an iron containing only 2 per cent. silicon and 0.8 per cent. phosphorus gets a cast iron containing about 1.3 per cent. silicon and 0.6 per cent. phosphorus; which are two totally different cast irons, but each having the right to be called "semi-steel."

The writer used steel, in quantities ranging from 5 per cent. up to 65 per cent., long before he heard of semi-steel. Putting 25 per cent. of steel into a cupola mixture may reduce the carbon content of that mixture to, say, 2.6 per cent., while 50 per cent. of steel would reduce it to, say, 1.8 per cent. It will depend entirely upon the cupola practice whether the resulting "semi-steels" contain anything from about 2.8 per cent. up to about 3.9 per cent. of carbon. It is a matter of composition all the time and every time, and until composition is understood and quoted, the terms "cast iron," "semi-steel" or "steel mix" are merely trade names, and an iron giving 17.5 tons tensile and 3,500 lbs. transverse (on inch-square bar between 12-in. centres) may be any of the many qualities of iron which under the easy conditions of testing common to this country happen to pass those tests. Meanwhile, if anyone wishes to stipulate that the writer shall put 25 per cent. of steel into a mixture and neglects to say what the remaining 75 per cent. shall consist of, he has not—in the words of the movies—"worried me any." A word in your ear, however: "Providing a cast iron is scientifically made according to composition, how can we detect whether there was steel used in the mixture?" Answers to this query will be treated kindly.—Yours, etc.,

H. J. Young.

3, Central Buildings, Westminster,
London, S.W.1.
October 7, 1930.

To the Editor of The Foundry Trade Journal.

Sir,—We do not seem to arrive at any conclusion on the question of semi-steel. We have here a material which is in every way excellent, capable of production in any foundry, giving greater strength, capable of standing up to higher temperatures, and suitable to resist the higher pressures now demanded by engineers, than straight grey iron, and yet the standardising of the varying percentages of steel melted with pig, etc., to give varying results required by different specifications, seems either to be no one's job, or a job desired by no one.

There are jobs being made in steel which can well be made in semi-steel—chilled jaws, firebars, superheater castings, etc., and if the production of semi-steel was as common as it easily could be, these jobs would be made in the iron, instead of the steel foundry.

I should like to see a small electrical equipment made wholly of semi-steel castings, where suitable, and compared in results (power transmitted) with a similar unit where grey iron was used. "Vallishe" should look on me as a comrade, not an antagonist. I suggest 15 per cent. as a minimum. Semi-steel itself gives the maximum that can be used, as with over 60 per cent. (and then only in suitable jobs governed by section), no matter how hotly melted, it is necessary to jump about once the metal is in the ladle.

I know some foundries make what they call semi-steel as cheap as grey iron, but it is definite that, to get results required, the method is more expensive than producing grey iron. With regard to "Vallishe's" point, in travelling the country in search of orders I have had some experience, and find that usually the only reply of buyers is "price." If engineers would get closer to foundrymen it would be to our mutual advantage, and very soon the foundries not supplying semi-steel or its equivalent would be in danger of being rationalised.

We have only made small pipes and have no experience in pipe work generally, but must say that the larger the percentage of steel, the greater the contraction. The points I should like to emphasise are that semi-steel cannot be made unless the cupola is made suitable for producing it, and very largely this holds good in the production of grey iron. "Semi-steel," or some mutually agreed title, should be given its proper place in the trade. To be successful in the production of this material (consistently), certain steps must be taken which are not necessary in making grey iron. For several weeks mention has been made of melting control and cupola practice in the editorial remarks, and the cupola is where good, or not good, iron is made.

A trade mark I do not think would help, as one could not expect specifications to be made asking for our "Litebutmild," but could be expected asking for "semi-steel."—Yours, etc.,

"Riley."

October 11, 1930.

Rugby Foundry Classes.

To the Editor of The Foundry Trade Journal.

Sir,—In the October 9 issue of The Foundry Trade Journal I see that reference is made to the classes for foundry apprentices which have just been commenced at the Rutherford College.

It may interest your readers to know that a three-years' course for foundry apprentices has been in operation in this college for the past eight years. At first, owing to lack of accommodation, these classes were mainly theoretical, but now, new laboratories having been built and equipped, practical experimental work in moulding, casting, and the properties of the materials used, is regularly carried out. The syllabus includes foundry technology, drawing, calculations and English.

Owing to the scheme for endorsement of certificates which we are adopting, this year several students who have successfully completed the foundry course have entered for the National Certificate course, and also several of the more ambitious students have transferred from the foundry course to the National Certificate course.—Yours, etc.,

J. Boothroyd.

Department of Mechanical Engineering,
Rugby College of Technology and Arts,
Rugby.

Tight screws and nuts can often be freed by applying vinegar round them and leaving overnight.

Random Shots.

It must have been rather a shock to a number of worthy people in this country to learn that one of the reasons for the new Canadian Tariff Bill being rushed through was the fact that shoes from Northampton, "manufactured under cheap-labour conditions," were being dumped into Canada! We can complain about the need for protection against cheap Japanese, continental or Indian labour, but we feel indignant at our own workers being described as "cheap labour."

* * *

You have all heard stories about Englishmen, Irishmen and Scots being wrecked on desert islands and how they gave expression to their national characteristics; perhaps you have read the immortal Bab Ballad about the gentlemen who were so circumstanced and who had never been introduced. The more modern way is to put it something like this:—One Englishman is a gentleman; two Englishmen make a club; three Englishmen make a colony.

* * *

Those who like trying to sum up other nationalities and their weaknesses will be amused at the following examples given by Mr. Sisley Huddleston in his recent book "Europe in Zigzags":—

"One German is a philosopher; two Germans have an argument; three Germans make a political party.

"One Frenchman is a talker; two French people are a *liaison;* three French people make a *ménage*.

"One Austrian is a charming fellow; two Austrians make a newspaper staff; the third Austrian is always a Polish Jew.

"One Swede is a Scandinavian; two Swedes make a Polar expedition; three Swedes make a massage institute."

* * *

At long last I see that something like the truth is beginning to filter through about Russia, or, more correctly, the United Socialist Soviet Republics. Those who are fond of thinking that we no longer live in exciting times might reflect that they are living in an age in which the most stupendous social experiment of our time is actually going on. It appears to have every intention of continuing, largely by the fortitude and endurance of the masses of the Russian people.

* * *

It is impossible to indicate in a brief space what is happening, but, broadly, the people seem to be not worse off than they were in pre-Revolution days; the depressed classes of Russia are the professional classes. Money is of no value, for there is nothing to purchase with it. Every penny that the Government can raise is being expended on essential machinery from abroad, and the people go almost entirely without luxuries in order that this may be done. Similarly, a good deal of food, that would be welcomed in Russia, appears to be sold abroad to increase the country's purchasing power and so facilitate the famous five-year plan.

* * *

Travelling, hotels and the ordinary amenities of civilised life are either very poor or non-existent. Many foreign experts are being employed by the Government to start the wheels of industry going again, and new works and industries are being planned on no small or uncertain scale. The social observer has enormous food for reflection to-day in the internal and external conditions of such European Powers as Russia and Italy, who have so decisively rejected the painfully built-up systems of centralised government, with parliamentary control, which is the chief contribution of Great Britain to the civilisation of Western Europe.

Marksman.

A Twelve-Year Review of Foundry Industrial Relations.

An address on the relationships between the employees and employers in the engineering and foundry industries and a review of the happenings of the past twelve years were contained in the Presidential Address of Mr. William Shaw to the members of the Middlesbrough Branch of the Institute of British Foundrymen on October 10, 1930.

Mr. Shaw was supported by the National President, Mr. F. P. Wilson, and the Hon. Branch-Secretary, Mr. F. A. Harper, and an encouraging attendance of members.

PRESIDENTIAL ADDRESS.

In his speech Mr. Shaw said: Mr. Ridsdale and Gentlemen,—In opening my address this evening I feel I ought first to refer to the Conference held in Middlesbrough in July. I should be lacking in my duty as President of the local Branch if I did not offer the congratulations of the Branch members to our Past-President, Mr. F. P. Wilson, who was on that occasion elected National President of the Institute of British Foundrymen, an honour which we share with him, and trust his year of office may be a happy and successful one. To our Branch-Secretary, Mr. Harper, we owe a debt of gratitude to the able and efficient manner in which he carried out his duties. We were also fortunate in having as our assistant financial secretary such a sound and honest worker as Mr. Bashford, who conducted the financial side of the Convention in a manner beyond praise. We also offer our thanks to Mr. Thorpe for the admirable way he looked to the comfort of our guests; he spared no effort to make the gathering, from a social standpoint, the success it was. I should like also to thank on your behalf Mr. Hackwood for the way he handled the transport problem. In fact, I question if any Branch could have been more fortunate in having amongst its members such a willing and unselfish band of workers. I thank all of them on your behalf for the way they carried out their duties on that important occasion.

An Industrial Review.

My year of office has unfortunately fallen at a time of deep depression in the engineering and foundry industries, but I believe we have about touched the bottom, and it is with this feeling that I propose to look backwards and review the happenings during the last 12 years. It is good sometimes to look back and see if we can learn anything which might be of use in the future, and also to see to what extent the happenings during those years may account, in some degree, for the present unsatisfactory condition of the industry. I propose to examine the relationship between the employer and the employed in the engineering and foundry industries during these last 12 years, giving just a bare outline of what happened. At the end of the Great War considerable difficulty was experienced in changing over from war work to ordinary industrial requirements. This takes us into the beginning of 1919. The first serious post-war change that took place was the introduction of the 47-hour week with one break each day in place of the 53-hour week with two breaks. This change took place on January 1, 1919. The change took a considerable time to adjust itself, and for quite a while we seemed to be chasing that hour about day after day.

Early in 1919 I was asked to take a seat on a committee which had been set up by the national body of the Engineering Employers' Federation, on the one hand, and the National Union of Foundry Workers, on the other. I accepted this invitation with enthusiasm, as the object was to examine and set up a fresh standard in our foundries for post-war working conditions. We had several meetings, and although considerable progress had been made things seemed to be hanging fire, and in August the reason of this came to a head by the chairman of the trade-union representatives on the Committee handing across the table to us an ultimatum to the effect that unless we granted to all members of the Foundry Workers' Union—working in federated foundries—a minimum wage of £5 per week for time workers and an equivalent advance to those working on payment by results, their members would cease work at the end of four weeks.

Results of National Strike.

Our chairman explained that it was neither the place nor the time to put forward such an application, but nothing we could do would influence them and they refused to withdraw this application. We were eventually elected, *en bloc*, by the Management Committee of the Federation as the National Strike Committee.

The strike began on September 20, 1919, and ended on January 26, 1920, lasting 19 weeks. This long drawn-out struggle gave the Continental foundry people the opportunity they were ready and eager to grasp, and they made every effort to secure a foothold in our home and export markets. One illustration will suffice to show as an example how the home market was effected:—My firm had an order for six large electric-generator frames, each weighing 10 tons; the pattern, which we had also contracted to supply, was completed when the strike began; during the strike period our customer began to press for delivery. We explained what he already knew—that we could not effect delivery until the moulders returned to work, but that the pattern was ready for the foundry. They, however, refused to wait and cancelled the order, paying us £90 for the pattern and telling us to break it up as they had placed their order on the Continent, and the foundry people there had made their own pattern. It transpired that the firm not only placed their order on the Continent, but that they had bought the controlling interest in the foundry there, with the result that we have never done any work for them since.

A period of activity in the foundries followed the settlement of the strike, owing to the engineers being short of castings. Then, when it looked as if we were settling down to a period of fair trade, the Engineering Employers' Federation found it necessary, in March, 1922, to lock-out all the members of the Amalgamated Engineering Union. This lock-out lasted for 13 weeks. This dispute to a very great extent centred round the question of managerial functions. Again, when we seemed to be settling down to work, late in 1922 a trade slump swept right through the industry, the like of which we had never experienced. This slump continued until the middle of 1923. Our competitors on the Continent never experienced this slump. Again trade improved to a certain extent, when the Amalgamated Engineering Union, along with all the other important trade unions, including the Foundry Workers' Union, made application for an advance of £1 per week to all time workers and an equivalent advance in payment-by-result prices to all the members of the various unions. When the Negotiating Committee—of which I was a member—met the delegates, the latter numbered 119 and represented no less than 44 trade unions.

These negotiations lasted for three years, and resulted in an advance of 2s. per week being granted in 1927; this 2s. was added to the war bonus of 10s. per week for plain time workers only, no advance being given to those on payment by result; wages to remain stabilised for six months. During this period, whilst the conferences were in progress, the coal strike began in May, 1926, and lasted until the end of the year. In June we had the general strike. There is no need to enlarge on either of these costly disturbances! For eight months of the year under review (notwithstanding the hopefulness of the industry at the beginning of the year) we were in a state of depression bordering on collapse. My firm was using coke costing 60s. per ton to help and keep our customers supplied during this difficult and trying period. The engineering and other unions faithfully observed the six months truce, but in March, 1928, they again asked for an advance of 8s. per week for all time workers and an equivalent amount for those on payment by result. Conferences took place at intervals, and it was not until November, 1929, that unions were told plainly it was impossible to grant any further increase in wages, and that industry could not carry any further load.

To attempt to place before you the masses of figures, amounting to many millions of money, which were compiled to prove our inability to pay a higher rate of wages will only weary you. It was, however, agreed then and is to-day that the earnings of the engineer and moulder are below what his skill, and the fact of his having served his apprenticeship to the trade, warrants. Still, the fact cannot be lost sight of that, at that time, you could take 5¾d. into Germany or Belgium and command the services, for an hour, of the most highly-trained craftsman in the world. Mark you, I do not say the finest. It was a question then and is to-day not what we should like to pay, but our ability to pay. You cannot pay wages out of industry if the money is not there. During the period under review, however, the cost of living kept steadily falling, as the following figures will show. In December, 1920, the cost of living in this country was at its peak. The figures are taken from the Ministry of Labour monthly returns and are as follow: For food, only 182 points above 1913, and for food, clothing, rent, fuel, light, etc., 169; whereas the latest returns this year are for September, and show a very considerable drop, being 44 and 57. These reductions in themselves represent the equivalent of a very substantial rise in wages, and in my opinion is the proper way to improve the lot of the wage earner.

Union Memberships.

At the meeting, in May, 1929, of the National Committee of the Amalgamated Engineering Union, a proposal for a ballot vote of their members for a strike should the national wages increase of 8s. per week not be granted, was defeated by 38 votes to 14, but by 46 votes to 6 it was decided to discontinue the Peace Conferences in London, and so the matter rests. The net result of all these happenings has been disastrous to both parties; from the employers' point of view markets abroad have been lost, many we cannot hope to regain, and the home market flooded with Continental castings and forgings offered at prices with which we are unable to compete; not to mention the serious financial loss to both parties.

From the trade unions' point of view the following reduction in membership during the last ten years should bring home the futility of strikes and lock-outs: The Foundry Workers' Union in 1920 had a total of 54,000 members, and in 1930 this was reduced to a total membership of 28,000.

In the federated shops of the North-East Coast alone there were employed, in 1920, 2,698 moulders and core-makers, and in 1930, 1,531. The reduction in the number of men employed—members of the A.E.U.—is equally startling.

Make no mistake regarding my reason for producing these figures! From an employer's point of view it is far better, and more satisfactory, to treat with a properly organised, financially sound and well-led body of workpeople than to attempt to get a settlement of an important question with an unorganised body of workmen.

This shrinkage in membership will make the question of manning our foundries with skilled men difficult if and when a period of good trade should come along; there is bound to be a shortage, and the usual poaching of men is likely to proceed, thus producing dissatisfaction in the shops. But this is not all, for during the moulders' strike many firms turned their attention to the advantages to be obtained by substituting machine moulding in place of hand moulding, and the uses of mechanical core-making machines in place of hand-made cores. During the coal strike, again, the employer was pressed and tempted to turn his attention to the use of oil firing in place of coal firing, and many operations which previous to that strike were carried through using coal are now entirely carried out with oil firing.

So we find that from whatever viewpoint we examine it the strike and lock-out as a weapon is one which should only be used as a last resort by either party. The position we find ourselves in to-day is one to give great anxiety, as the loss of export markets and lack of trade at home makes business very difficult. The engineering and kindred industries can only flourish if and when our export trade is in a healthy state. We cannot live by taking in each other's washing; in other words, by the home market alone. It is, however, admitted that the engineer cannot proceed very far with any new work without it reflecting on the foundries, for, after all, a casting is the base of almost every machine that is built. Then, during all this period, there was this terrible uncertainty that we might have to face at any moment a serious advance in wages, applied for at different times. This made it almost impossible to quote a keen price for long-term contracts. The difficulties ahead seem to be a lack of new markets abroad.

To what extent this can be solved by a better understanding between the various units which go to form the British Commonwealth of Nations should be known in a very short time, seeing that the Imperial Conference is now sitting considering this question. Some form of inter-trading between the various units of the Empire—each unit supplying that which it is best fitted by nature to produce—would appear to go a long way towards solving this most urgent matter. You may have the best plant available; you may have the latest machines and a highly-trained body of workers, willing and ready to give of their best, but all these conditions combined are of no avail unless you can keep all of these units fully employed with work at a price which will allow you to pay a living wage to the workpeople; a fair dividend on the capital invested in the concern; and, not the least important, have sufficient left to admit buying new plant and machines when necessary, and keep the foundry buildings in a proper state of repair.

In conclusion, I hope that this review of some of the mistakes which have been made during the last 12 years may be of use to our younger members when they in turn have to carry on when some of us have left the industry to their care. I thank you, gentlemen, for the patient way you have listened to this none too happy address, and hope that you in your hearts may, as I do, say "never again."

Cost of Hardening Steel by Nitriding.—It was mentioned recently at one of the meetings of the American Society for Steel Treating that nitriding steel, containing about 1.25 per cent. aluminium, 1.3 per cent. chromium and 0.25 per cent. molybdenum, costs about 8 cents per lb. The rough machining of the piece costs about 75 per cent. more than regular case-hardened steel. In the nitriding operation itself, the labour to pack depends on the shop. The ammonia will cost about $10.50 for 50 lbs. For the time of 20 to 45 hrs. in the furnace at a temperature of 520 to 540 deg. C.. the cost depends on shop practice. Altogether the cost will be about 4 cents a lb. more than carburising.

Book Reviews.

The Metallurgy of Bronze, by H. C. Dews. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 12s. 6d. net.

This is the type of text-book which we have been advocating in our book reviews for some time. It recognises, *ab initio*, that modern conditions demand specialised knowledge in restricted areas of wider fields. What has usually been done in the past—taking Mr. Dews' book as an example—has been to write a weighty tome on non-ferrous metallurgy; to incorporate a more or less large section on a matter about which the author has specialised knowledge, and to pad out with material which has previously been printed. This old-fashioned system had two main drawbacks: primarily, one had to pay for much material easily available elsewhere, and secondly, as works of reference—except on a few restricted items—the searcher received almost valueless information. We hope that numerous other specialists will slavishly emulate the basic principles of this book and confine themselves to matters about which they possess specialised knowledge. The scope of the book has been designed to cover the equilibrium copper-tin diagram; the cast, structure and properties of both special and ordinary bronzes; the effect of various elements and physical factors on bronze; and, finally, a section of bronze-foundry practice.

Metallurgy, in its most fascinating aspect, is well brought out in Chapter VI—the Effect of Lead on Bronze. Here is told the story of a number of conscientious workers producing non-concordant results because of the non-control of all the variables. Herein is the germ of the greater number of metallurgical disputes.

The author holds a certain number of strong ideals, one of which is apparently proprietary alloys. If the composition and other technical data are broadcast, then we prefer proprietary names, as it is a safeguard against a type or range of alloys being sold purely on a price basis, associated with cuts in quality. We believe that if cast iron in its infancy had been given proprietary names for its various modifications, it would be in a better position to-day. Proprietary names often stimulate research, and always greater care in manufacture. However, there is another side to this question and no better nor more eloquent advocate of it exists than the author of this book.

Bronze-foundry metallurgists will welcome the chapter on the minor constituents of bronze, as it covers adequately, yet *en résumé* the effect of aluminium, iron, arsenic and antimony.

The question of the effect of gases in bronze is opened up in Chapter IX, for nobody can say that it is resolved. Allen's work is late enough to be included and appreciated, but we agree with the author that much work has still to be done. Mr. Dews' attitude to the present position of affairs is shown very clearly by three quotations culled from two pages only:—"There is considerably less known about . . ." "Meagre success has rewarded most of these efforts." "Nobody has yet shown . . ." These phrases are of the utmost importance and should be taken by the research workers as "tips" for urgently required data.

Probably the best chapter in the whole book is that devoted to "Casting Temperature." The statements made are largely the result of the author's wide personal experience in the control of an important bronze foundry, and his fellow-workers can consider themselves fortunate that they have such reliable information so readily available.

We think it fair to our readers to point out that the chapter on bronze-foundry practice does not include any moulding methods, but confines the subject to melting and kindred subjects.

The book carries two appendices, one giving information on the micro examination of bronze and the other a table of physical constants of the bronze constituents. We congratulate the author on having refrained from extending these to include all the various conversion tables, as seems to be only too common nowadays. The book is excellently illustrated and fairly well indexed. We strongly recommend this book to those interested in brass- and bronze-foundry practice as being a model text-book for at least the needs of the latter. V. C. F.

Engineering Materials, Vol. III (Ferrous Aircraft and Automobile Materials), Theory and Testing of Materials, by Arthur W. Judge. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 21s. net.

This book, which is divided into 25 chapters, contains about 500 well-illustrated pages, and is infinitely cheaper than the average technical text-book. It is perfectly obvious that the author tackles his subject from angles differing from those current in the foundry industry. The controversies centred around small trepanned test-pieces, tested transversely or by shear, the cast-off test-bar, the size of test-bar to represent average section of casting, and X-ray testing are not commented upon. Actually, very stereotyped lines have been maintained throughout, which we claim adds to its value as a text-book. Obviously, for the majority of our readers, Chapter III—The Testing of Cast Iron—will be the most interesting. Herein the tensile, transverse and shearing strengths of cast iron are dealt with, as well as the effect of temperature on tensile strength. We always feel convinced that the engineer attaches far too much importance to tensile strength. This book, for instance, has been oriented to a consideration of materials from the aircraft and automobile angles, yet in the latter industry we suggest that tensile strength is one of the least important factors. The chapter on Hardness of Metals is well worth study, and shows again the tendency of the engineer to correlate everything to tensile. Quite a large amount of space is devoted to special testing machines, and we just wonder whether a list of makers and types would not largely meet the requirements if descriptions were given of the lesser known machines, but still interesting, like the alternating-stress testing machine designed by the late Prof. Arnold.

As this is meant to be a comprehensive text-book, we welcome the inclusion of the appendices containing tables of constants and conversion tables and the like. The book, which is extremely well balanced, is worthy of a better index. It is well printed and the student will appreciate the inclusion of a number of bibliographies, conveniently placed at the end of each important chapter. V. C. F.

A Catalogue of British Scientific and Technical Books. Published by the British Science Guild, 6, John Street, Adelphi, London, W.C.2. Price 20s. 9d. post free.

Amongst a multitude of other lists this work contains a list of 29 books on foundry practice, including Searle on refractories, Clements on blast-furnace practice, Wormald's "Blacksmiths' Pocket Book" and the Conjoint Societies' Symposium on slags. Whilst definitely incomplete, and if the founder, to obtain this and maybe one or two allied lists, has recourse to this book, he will have armed himself with a fair-sized tome containing 13,915 book titles, dealing with a hundred-and-one different branches of scientific activities. To be candid, we cannot envisage the utility of such a publication. We expect such people as the Association of Special Libraries and Bureaux of Information to cover such work in collaboration with the technical Press and scientific and technical societies.

Designing a Mass-Production Foundry.*

By Norman C. Blythe.

This article deals with the lay-out and equipment of a large foundry for the mass production of castings which have to be machined and pass pressure and soundness.

For necessary reasons, the essential considerations affecting the design of a foundry are contained in the above qualifying statement in a very elastic form, and it is, therefore, incumbent on the author to define these points more precisely in so far as they affect his work. The general specification given for the product is one which is commonly applied to high-grade engineering castings, and the suggested lay-out is for the manufacture of iron castings in this category, but of a general rather than a particular type, and within the limits of a few pounds to one ton in weight.

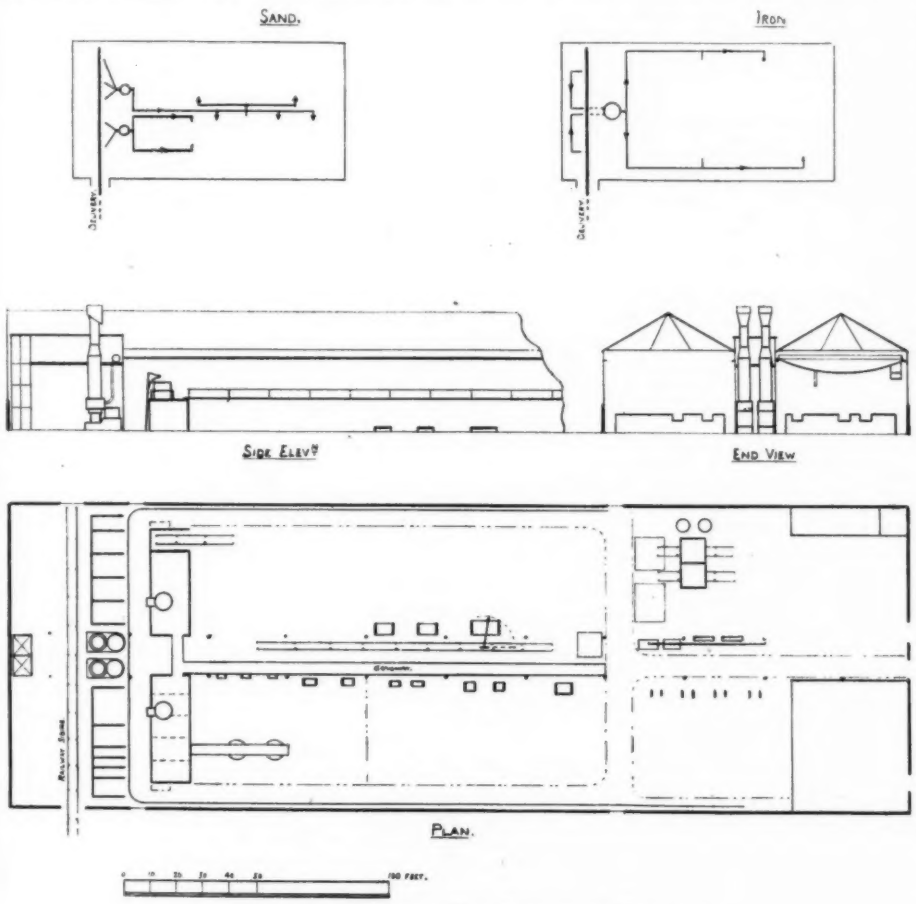

Fig. 1.—Lay-out for a Mass-Production Foundry.

The degree to which a casting can be produced in mass and the consequent amount of equipment necessary is dependent on the demand. The manufacture of automobile parts, for instance, offers scope for the use of numerous labour-saving machines which would not be profitably applied to the production of repetition castings in lesser quantities—or, in fact, to the variety of product under consideration. It is a question, therefore, of utilising such equipment as will promote mass production and at the same time show a profit to justify its installation.

The foundry has accordingly been designed to meet these conditions, and to produce repetition castings in an approximate quantity of 60 tons per week. An endeavour has been made to attain a thoroughly practical result. In the preparation of the scale lay-out due consideration has been given to the disposition and possible interference of the structural columns of the building, and to the dimensions of railway track and wagons and such standard equipment. With the exception of a few minor details, all the machines are ordinary marketed products, so that any originality which may be achieved will not be at the expense of being fantastical.

* This Paper, read before the Scottish Branch of the Institute of British Foundrymen, was awarded first prize in the John Surtees Memorial Competition.

General Constructional Details.

Let it be assumed, in the first place, that the available site has the convenience of a railway siding and suitable roads. The building is a steel-framed structure, consisting of two main bays, 50 ft. wide, and one narrow bay, 15 ft. wide, situated between them, all of which extend to a length of 330 ft. Maximum daylight is obtained by the roof and upper part of the walls being constructed of glass, and provision is made for overhead cranes to operate in the two larger bays. The area covered renders it possible for all the operations to be carried out inside the building, from the unloading of the raw material to the despatch of the casting, and, in addition, these processes are almost entirely conducted on a concrete floor. This latter feature is one which might be adversely criticised, and the author is fully aware of the general belief among foundrymen that such a moulding floor would prove unsuitable. Nevertheless, experience has shown that, so far as a machine foundry is concerned, many of the troubles are non-existent, and it is found that a concrete surface wears well and provides a solution to the transport problem created in many foundries by the uneven nature of the floor.

For the purpose of describing the lay-out and equipment, the work has been divided into three phases:—(1) Material handling and preparation, (2) moulding and moulding machinery and (3) the preparation and inspection of the casting before despatch.

Handling of Raw Material.

A scientific lay-out to minimise handling is more necessary in the foundry than elsewhere, because there are larger quantities of material complementary to the production of the article than in other manufactures. A conservative estimate shows that some 80 tons of iron, 60 tons of floor sand, 15 tons of new sand, 8 tons of coke and smaller quantities of other materials will have to be handled several times in order to produce 60 tons of castings in one week.

Pig-iron, coke, new sand, etc., is delivered by rail and by referring to the lay-out, shown in Fig. 1, it will be seen that the siding is so placed that accommodation for material is available on either side of the track. Pig-iron, coke and cupola materials are discharged to the left, while, on the right, several brickwork compartments having openings corresponding to the side door of wagons are provided for sand, stove fuel and the like. The unloading of sand and fuel is accomplished by a grab bucket, suspended on either of the cranes, which is capable of emptying a wagon containing 9 tons of sand in 30 minutes. The passage in front of the bins provides for alternative delivery to them by road transport, but, in either circumstance, it is necessary for proper working that sands for moulding and coremaking purposes are stored in the sections allocated to them.

The heating of the two batteries of stoves for mould and core drying respectively is done by passing an air blast over the grate bars of two separate underground fire-boxes situated at the extreme ends of the stoves. The hot air rising into each stove from an underground flue produces a uniform and easily-controlled temperature combined with a high efficiency. It is probable that a more central position for the fire-boxes, as far as fuel conveying is concerned, would be between the batteries, but the danger of a possible "run-out" at the cupolas cannot be overlooked in view of their proximity to this point. There are five stoves in each battery, and with the exception of two, which are slightly narrower, they have inside dimensions of 15 ft. long, 7 ft. 6 in. wide and 8 ft. high.

Sand Preparation and Distribution.

A Simpson sand mixer, intended for the preparation of facing sands, is situated on top of the mould stoves and is insulated from them by an air space or similar means. The construction, therefore, has the dual advantage of conservation of space and a ready platform for obtaining the desired elevated platform for the plant. The machine consists of a bucket loader, which feeds the sand into the mixer and ultimately through an aerator before discharging it into barrows, and except that the loader has been extended to operate from ground level, the complete unit is standard equipment. The convenient position of the loader in relation to the sand bins makes it possible for one man to keep the mill charged with the proper mixture while another is engaged in delivering the treated sand to the moulding machines.

Distribution is effected along an overhead gangway, which starts at the platform and con-

tinues along the narrow central bay at a height of approximately 9 ft., so that three hoppers, placed at points along its length, may be easily filled with facing sand for use in the three pairs of moulding machines situated below. This constitutes one of the important features of the lay-out, in that the narrow bay acts as a central sand road, and all the sand is concentrated along its length. This also applies to used sand. After being emptied from the boxes it is carried back to the sand road in small trucks, with the exception of any quantity returned to the mixer, where it is reconditioned and heaped beside the machines by a Royer sand mixer and so made ready for use again as backing sand.

A portable type of sandslinger, mounted on a bogie, travels on a small-gauge track in the road, but as this is in reality a moulding machine, it will be considered later under that heading. It is sufficient to say that it can be fed with facing sand by a flexible travelling shute suspended from the gangway, or with backing sand from the sand road.

It will be noticed from the lay-out that the preparation of the oil-core sand is in many respects a duplication of that already described for moulding sands. A similar type of mixer without an aerator occupies a corresponding position on top of the core stoves and deals with the sand in the same manner. The sand for the core machines is fed to them from the central road, while the core benches receive their supply from a separate overhead gangway, which has vertical shutes leading from it to circular benches underneath.

Melting Units.

The remaining material which requires handling and preparation is the iron. This, in the form of pig-iron and scrap, is weighed out in bogies in quantities of a ton, representing one cupola charge, and taken to the charging platform in one of the hoists provided for that purpose. Coke and flux are similarly handled, and the whole charged to the cupola as required. The molten iron is tapped into two or three ladles and these are carried on a runway trolley to either side of the shop, where they can be picked off by the cranes and the contents cast into moulds.

There are two cupolas conforming to the design of the Stewart "Rapid" type, having an internal diameter of 42 in. and a melting rate of 7 tons per hour, blast being independently supplied to each by a separate fan. Something of a departure has been made in this respect, for in order to eliminate an underground blast pipe, the fans are placed on the charging platform immediately behind the cupolas, and a vertical main descends to each tuyere belt. On account of the fact that the charging platform is entirely within the narrow bay, it is easily constructed of reinforced concrete, and is provided with a roof and walls having adequate openings for ventilation. Spark arresters complete the furnace equipment, and these can be periodically cleaned from the platform.

The underlying factor governing these lay-outs has been a desire to achieve as nearly as possible a straight-line graph of the progress of each item of material. It will be manifest that such a result is almost impossible, but the diagrams show that some measure of success has been attained in preserving, at least, a continuously forward motion. Such is the scientific aspect of material handling.

Moulding Machines.

Moulding is done entirely by machinery, and the general practice is to use green-sand moulds wherever possible and to revert to dry sand only when the former method has been unsuccessful. Modern development is in this direction, and by careful selection and treatment of facing sand a serious proportion of the castings of the type described can be successfully produced. A characteristic of these castings is the number and variety of shape of the cores required, and for this reason they are made entirely in oil sand. The system of blocking the pattern for cores is also applied to a large extent, and although the prime reason for this method is to simplify the pattern so that it may be readily withdrawn, it has the additional effect of reducing the amount of dry-sand work. While being often very economical, the system calls for an abnormal number of cores, and the core department and stoves are accordingly laid out to meet this demand. Perfect patterns and core boxes and consequent perfect moulds and cores are essential to successful machine moulding, and, where necessary, jigs and fixtures are provided to obtain correct location of cores.

So far, the machinery has been driven by electricity, but, as this is unsuitable for moulding machinery, pneumatic power, supplied from a compressor at 80 to 90 lbs. per sq. in., is used. It may be safely said that, in spite of its higher cost, compressed air is most suited to the peculiar requirements of mechanical moulding, combined with cleanliness and elasticity.

Six machines of the jolt-ram roll-over draw-pattern type are placed in line on one side of the sand road and are supplied with facing and packing sand as already described. These have tables varying in size from 2 ft. by 2 ft. to 4 ft. by 3 ft., so that they are capable of producing moulds in boxes approaching those dimensions. Six travelling beams fitted with hand-controlled electric cranes of 30 cwts. capacity span the bay over these machines, and at least four of them are maintained to handle the moulds and to set them in line positions across the bay, where they may be cast and ultimately shaken out. Very small castings are made from a set of eight squeezer machines of the Tabor type, situated as shown, and the moulds are of such a weight that they can be conveniently handled by the operators.

It is intended that the jolting machines be devoted to green-sand moulding, and, although dry-sand mouldings may be also made, these, together with heavier green-sand work, are for the most part made on the three machines opposite. The sandslinger works in conjunction with them and does all the ramming, while the machines are designed merely to turn over the box and draw the pattern. They have tables 6 ft. by 5 ft. (2 off) and 7 ft. by 7 ft., which are universal to most sizes of boxes, so that they may be all engaged on and capable of completing green-sand work before going on to dry sand. Ample floor space is available for coring, closing and finishing of green or dried moulds, and the lifting and carrying is done by four 5-ton overhead cranes. The class of work frequently necessitates a three-part mould, and the sandslinger is the only machine known to the author which can ram two parts, one on the other, even when the joint is not level—hence its use.

Air pipes extend to all parts of the shop and are used as a substitute for bellows, while the blackwash is also sprayed on to the moulds by this means. The moulding boxes are mostly of cast iron, and since they have machined faces they must be kept under cover, and are actually stored beside the machine on which they are used.

Roll-over machines are also applied to core-making and are arranged for hand or power ramming according to the size of the work. Very small cores are made by hand at the two circular benches, which can each accommodate four core-makers. The largest cores are loaded on a carriage, but the majority are placed in specially-made steel racks, which are lifted and carried to the stoves by lift-trucks when full. After stoving, the cores are pasted and dressed at a long bench and are stored there or delivered to the moulders if required.

Dressing and Inspection of Castings.

The castings are taken to the dressing department by crane or truck. Those from the squeezer machines are immediately placed in the tumbler barrels and then ground ready for despatch, but the remainder are first laid on the fettling floor, where the cores are removed. This operation is done on two large gratings having spaces of sufficient size to allow the sand to fall through into hoppers free from core irons, scrap, etc., and thence by a bucket elevator into a raised storage hopper, from which it can be easily dropped into trucks and removed. The castings then enter the blasting cabinets and pass out at the other side when cleaned, where they are finally dressed. This latter operation is considerably expedited by the use of pneumatic chisels and portable grinders.

In many foundries the castings are despatched at this stage, but nevertheless it is their duty to ascertain as far as possible whether the casting is good or bad, quite apart from the faults which would normally cause its rejection in the foundry. It is admitted that many faults are and can only be discovered after machining, but it must be remembered that in all probability the machine shop is also working on a production basis, and it therefore means considerable loss of time if, after a casting has been machined partially, it is found that a core is off-centre or there is insufficient metal in parts. A system of inspection eliminates such delays, and proper tools and gauges are provided; the work is amply repaid by the result.

The several remaining details which have not been mentioned hitherto are, for the most part, offices, stores and services essential to the organisation, and do not require further explanation. In conclusion, however, it is necessary to assume that the arrangement whereby the castings are despatched by road transport completely meets the requirements and circumstances of the case.

DISCUSSION.

The President (Mr. J. Miller) said that they had listened to an interesting description of the foundry that they would all like but could not get. Mr. Blythe had gone into the matter in considerable detail, and he was sure that the author would be pleased to answer any questions.

Mr. J. Longden (Past-President) said that the Paper was a very creditable piece of work and, as the chairman had said, the description was of the kind of foundry they would all wish for; most of them had to be content with a bit added here and there, an arrangement which was not always satisfactory. He agreed with Mr. Blythe's all-progressive arrangement for the moving of materials and product except in one respect. The cupolas were rightly placed very near the place where the materials are received, but the stoves and sand-distributing plant had been placed in front of the cupolas. As a ton casting would require at least 25 cwts. of metal, could Mr. Blythe run a bogie containing 25 cwts. of iron anywhere? He (the speaker) thought it would be better to take the ladle straight to the job; in the lay-out shown the stoves were in the way. Except in that respect he agreed with Mr. Blythe's ideas and had no further criticisms to offer.

Mr. Blythe, in reply to Mr. Longden, said that if there was sufficient room he did not think it would matter much what was in the way. Even if the metal was taken through a tunnel it would not matter unless it was in that tunnel too long. He had considered whether there were any more obstruction there than at other places in the foundry. The metal had to be run across for about 50 ft. and then down the shop to where it was required, but at other positions it was necessary to run the metal across 100 ft.

The President proposed that they accord Mr. Blythe a vote of thanks for the Paper and hoped that in the course of time he would be in a position to put down a plant of his own and fill in the little details that he had omitted in the scheme which he had described.

The Reclamation of Sand in Steel Foundries.*

By M. D. Pugh.

According to available information, the average consumption of sand in steel foundries in the United States without any form of reclaiming system is about 1,500 lbs. of new sand for each ton of castings produced. In some foundries the consumption of new sand runs as high as 2,000 lbs. per ton of castings, the highest reported being about 3,000 lbs. In other words, for every ton of good castings produced, from three-fourths of a ton to one and one-half tons of new sand must be purchased.

The action of the molten metal on the silica-clay mixture is quite severe. The intense heat of the metal, 1,535 deg. C. to 1,650 deg. C., causes some of the silica grains which come in contact with the metal to shatter or fracture.

This intense heat in the mould also burns out some of the bond in the sand. If this resultant fine material—which consists of broken-down silica grains and spent clay bond—is not removed from the sand, it accumulates rapidly. In a short time the sand becomes so contaminated with fines and foreign material that the sand is unfit for further use. When this point is reached, it has been a common practice to discard the sand.

The high consumption of sand in steel foundries is due largely to the fact that it has been considered necessary to use new sand, sometimes 100 per cent., as facing in order to obtain satisfactory results. Where all new sand is used as facing, the sand heaps may grow so rapidly that it is necessary to throw away some of the used sand at regular intervals. This is usually done without regard to whether the sand is good or bad.

With efficient reclaiming or conserving equipment, and with careful control of the mixtures, the consumption of sand has been reduced to as low as 300 lbs. per ton of castings. In one or two instances, where the same grade of sand is used for both cores and moulding sand, reclamation and control has enabled the steel foundry to use all old sand for moulding purposes. The only new sand required is for cores. By reclaiming the sand from the cores, this new sand finds its way into the moulding sand and replaces the material rejected in the reclaiming operation.

Ways to Reduce Sand Consumption.

There are two ways by which the steel foundry can reduce or control the consumption of sand:—(1) by reclamation, and (2) by conservation.

For the purpose of this Paper, reclamation will be defined as the recovery of good sand from refuse or waste sand; conservation, as the removal of undesirable material from sand before it becomes so contaminated that it is unfit for moulding use. Since the high consumption of sand comes largely as a result of using new sand as facing, it is evident, therefore, that a reclaiming or conserving installation must turn out a sand, the properties of which are such that it can be used as facing. Unless the reclaimed sand can be used as facing sand, reclaiming or conserving will accomplish little.

In nearly all steel foundries old sand is used as backing. Backing sand, in addition to cohesiveness, has only one main requirement, which is that it must be sufficiently open or permeable to allow the escape of gases. A facing sand, in addition to permeability, must be resistant to the high temperature and the chemical action of the molten steel. If it does not have this refractory quality, the sand will "burn in" and, as a result, will not peel from the casting. This causes high cleaning costs and many rejected castings.

There are several things which may affect the resistance of the sand to the high temperature of the metal. Some of these are of a chemical nature, while others are physical. The efficiency of the reclaiming installation has considerable bearing upon the physical characteristics of a reclaimed sand. K. W. Grant, former metallographist of the Colorado Fuel & Iron Company, and now metallurgist of the Republic Iron & Steel Company, has made some extensive experiments in an effort to determine why sand fuses or burns in steel castings. In his survey he states that the condition might be caused by four factors, namely:—(1) Lack of uniformity in the size of the sand grain; (2) the amount and distribution of the clay bond and the quality of the clay; (3) the amount of water used in tempering the clay-sand mixture, and (4) temperature of steel when cast.

Size and Uniformity of Grain.

Since the temperature of the steel, the amount of water and the amount, quality and distribution of the clay bond are things that can be controlled within fairly definite limits, Mr. Grant, in his experiments, worked upon the basis of the size and uniformity of the sand grain.

Mr. Grant's report stated the following: "Chemical composition does not appear to be of any particular value in determining the suitability of the sand to withstand fusing. From what has been written on the subject of sand for steel castings, the size, shape and uniformity of the particles have a greater influence on the ability to withstand burning in than does chemical composition.

"In order to determine whether uniformity of grain size would be helpful to prevent burning in, test moulds for gears were made up of 40- and 60-mesh sand. After casting, the sand left the castings quite freely and showed little evidence of fusion. Over a considerable period of time, experiments were made using the 40-60-mesh sand on castings, the shape of which was apt to be troubled by burning in of the sand. In every case, regardless of the shape of the casting, the sized sand showed a decided improvement."

It is the opinion of many steel foundrymen that ramming also has considerable influence upon the manner in which the sand "peels" from the castings. It is claimed that uniform hard ramming lessens the tendency for the sand to stick to the casting.

John Howe Hall, in his book "The Steel Foundry," states that in a sand for steel moulding purposes "the larger the amount remaining on the 20-, 40- and 60-mesh sieves, the better the venting properties of the material. Some foundrymen prefer coarse sand, in which the greater part remains on the 20- and 40-mesh sieves, others get the best results from the finer sand, the greater proportion of which remains on the 40- and 60-mesh sieves." Mr. Hall adds that "whichever end of the scale is preferred, the greater the uniformity of the grain size, the better."

The author of this Paper, in co-operation with the W. S. Taylor Company laboratory staff, has had an opportunity to analyse, from a grain-size standpoint, samples of sand from nearly two hundred steel foundries in the United States and Canada—about one-half of all foundries listed which produce steel castings. This experience substantiated Mr. Hall's statements.

Variation in grain size is due to the kind of sand available within the locality of the foundry. However, some foundries are having sand shipped a considerable distance, paying high freight—in some instances as high as £2 a ton—in order to secure the sand they desire.

Foundries which are producing only light castings can use, of course, a finer sand than foundries producing medium to large castings. Furthermore, the type of furnace used has a bearing upon the temperature of the steel, and this in turn has a bearing upon the size of the sand. Electric steel castings are usually poured hotter than open-hearth steel castings, and as a result the sand for electric steel castings must have greater resistance to heat than for open-hearth castings. Whether dry- or green-sand moulds are used, determines to a considerable extent the characteristics of the sand.

Unsuccessful Attempts at Conservation or Reclamation.

There are two main reasons why some attempts at reclamation have been failures. The first reason is because the foundry does not give proper attention to the condition of the sand when it goes to the reclaiming equipment. In other words, they attempt to handle it too wet. If the sand is not dry enough for the individual grains to spread apart, no separating process can efficiently remove the fines and dust. The author has seen several examples of this. As long as the foundry screened sand that was comparatively dry, the reclaimed sand was free from fines and gave splendid results when used in the facing mixture.

At times, however, due either to rush of work or lack of attention, sand containing excess moisture would be fed to the reclaiming unit. Naturally, when the wet sand came from the unit very little of the fines had been removed. This sand was then used in the regular manner as facing, and as a result the casting finish suffered. As soon as this condition was corrected, the results immediately improved.

Degree of Dryness Necessary.

The question is often asked, "How dry must the sand be in order to be able to remove the fines efficiently?" Since the fines and dust are only liberated when the sand is dry, it follows that the drier the sand the more thorough will be the fines removal. Sand that carries too much surface moisture will cause the fine grains to adhere to the larger grains and, regardless of the type of separating process used, an efficient removal of the fines cannot be accomplished. There is no dust in a mud ball. Neither are there any free fines in wet sand. However, if the separating process used is efficient, sand that is dry enough to flow through the fingers is dry enough to permit a fairly thorough removal of the fines.

The second reason for reclamation failures is because the equipment used for separating the sand was not of a type suited for efficient removal of the detrimental material or the recovery of the good sand. The equipment left a considerable quantity of detrimental fines in the sand; as a result, an excessive amount of new sand had to be used in order to offset the bad effect of the detrimental fines. Experience has shown that new sand must be used in the facing mix in proportion as the fines are allowed to remain in the old sand.

Green-Sand Moulds.

The green-sand moulds must have a high permeability to permit the rapid escape of the large quantity of water vapour which is driven off in the mould. Preston, in a recent article, says that 1 cub. in. of sand will give off 30 cub. in. of water vapour for each per cent. of moisture contained. The average moisture content for green-sand moulds is 4 per cent.—therefore, for each cubic inch of sand, 120 cub. in. of water vapour is formed in the sand which lies close to the metal, and a corresponding amount for the sand further from the metal.

It has been the common practice to use a sand of coarser grain size for green-sand than for dry-sand moulds. With no provision for the removal of the fines accumulation, it has been difficult

* Extracted from a Paper presented at the Cleveland Convention of the American Foundrymen's Association.

to maintain a satisfactory permeability for pouring in green sand, and for this reason dry-sand moulds have been used even for medium and light castings. With the use of reclaiming equipment, a number of foundries which formerly made part of their work in dry-sand moulds find that they can change to green-sand moulds and secure just as good results, because a satisfactory permeability can be maintained.

Moisture and Temperature of Molten Steel.

The moisture in a green-sand mould tends to dissipate the heat of the molten metal. The surface of the casting solidifies before the sand lying next to it can fuse, provided, of course, that the sand is of the proper composition and that it is not too fine. Steel can be poured in green-sand moulds at a higher temperature and with as little burning-in as when poured at lower temperature in dry-sand moulds. It is not uncommon for steel foundries using green-sand moulds to report that they can use 90 to 100 per cent. of reclaimed sand for facing and secure as good or even better results as when using a large percentage of new sand. Since there is always some loss of sand in the reclaiming operation—such as fused or hard-burned lumps and sand which breaks down and is removed as fines—there must be enough new sand added to replace this loss.

In some foundries enough new sand may find its way into the heap through the cores to replace this loss in reclaiming. In other foundries the percentage of cores may not be great enough, and some new sand may be needed to maintain the heaps. In some cases this may be only a few per cent.; in other cases as high as 25 per cent. is required. The place to add this new sand is in the facing at the time of mulling.

Dry-Sand Moulds.

In a dry-sand mould there is little or no moisture to cause steam; therefore, permeability is not so important as resistance of the sand to the action of the molten metal. The refractoriness of the sand is of prime importance in the dry-sand mould. It has been a general custom to use slightly finer sand for dry-sand than for green-sand work. This, as has been mentioned before, is probably due to the fact that a satisfactory permeability is obtained in dry-sand moulds even with the finer sand.

The finer the sand, however, the quicker it will fuse at a given temperature, even though fine sand grains have as high a fusion point as the larger grains. It is just like a snowball and a snowflake. In contact with heat, the snowflake instantly disappears, while the snowball requires longer exposure before being greatly affected. The sand must resist the high temperature of the steel until the surface of the metal solidifies. The larger grains have a much better chance of doing this than the finer grains.

Only recently has it been considered practical to reclaim sand for dry-sand mould facing. The reason for this, no doubt, has been due to the fact that attempts have been made to use old sand as facing without first ridding the sand of detrimental material. Naturally, difficulty was encountered with such sand, and for this reason it has been considered impossible to use old sand as facing. Indications are that a smaller percentage of reclaimed sand can be used for dry-sand facing than when used for green-sand facing. However, 50 to 75 per cent. of facing for dry-sand moulds can be made by properly-reclaimed sand, and excellent results secured.

Moisture for Tempering Reclaimed Sand.

Reclaimed sand can be tempered with less moisture than sand not reclaimed and yet develop the same bond strength. The reason for this is that the fines take up water. The finer the sand, the more surface is exposed and the more water is needed to obtain the desired bond strength. This is an important point to consider. It is especially important for foundries using dry-sand moulds. The less water that is required for tempering, the quicker the moulds can be dried and the cheaper will be the cost of drying. In green-sand moulds, the less water required to temper the sand, the less water vapour or steam will be generated in the mould.

Sand which contains fines has a much lower permeability than sand which does not contain fines. This is because the fine grains fill up the voids in the sand. The greater the spread of grain size in the sand the lower the permeability.

Some foundrymen as well as engineers contend that it is just as important to have an open-backing sand as an open-facing sand. Of course, it is important that the steam and gases escape readily through the entire mould. In most instances, however, it is only necessary to remove the fines from the sand used as facing. When the moulds are shaken out, the coarser facing sand is mixed with the backing sand, and this will keep the entire heap sufficiently open so that it may not be necessary to remove the fines from the sand used as backing. In some foundries it may be found desirable to eliminate the fines, or at least a portion of them, from the backing sand. This is true if the purpose of the unit is to conserve the sand, or where all sand is prepared as facing.

Reclamation.

In the refuse or waste sand from the steel foundry there is a high percentage of good sand. This percentage may often amount to 60 or 80 per cent. of the refuse sand. These good sand grains, when efficiently recovered, can be used in place of new sand. Reclamation means nothing more or less than the recovery of good sand from waste or refuse. It is, in the final sense, a sizing process.

If the system used permits deleterious material to remain in the recovered sand, trouble will be experienced. The sand will not have its highest resistance to the heat, and the desired permeability may not be obtained. Improper separation may defeat the purpose of reclamation, as the experience of some steel foundries has shown.

Equipment Required.

There are two general types of equipment in use for reclaiming or conserving sand, namely:—(1) A two-surface, efficient vibrating screen which removes simultaneously the coarse foreign material with the upper screening surface, and the detrimental fines with the lower surface, and (2) a screen combined with air suction. The screen—either the revolving type or an enclosed single-surface vibrating type—is used to remove the foreign material at 6-mesh to ¼-in. clear opening. The air suction draws off the fines and dust while the sand is agitated by the screen.

For large tonnages the combination screen and air-suction method is considered by some more economical, but definite control over the grain size of the sand is more difficult. It naturally follows that a different type of installation is required for conserving the sand than for reclaiming only.

There are two general methods of conserving sand, as follow: (1) By treating all the sand used in the foundry. By doing this, all sand is prepared as facing sand. In other words, all of the sand used in the foundry receives uniform treatment. In this way the foundryman can have absolute control over all of his sand, and for some type of work the results obtained may warrant the investment and expense of so doing, and (2) by treating only a part of the old sand and using it as facing. This is merely taking a percentage of heap sand, removing foreign material and undesirable fines and using the cleaned sand in the facing mix. This treated sand finds its way back to the heap after shakeout.

This coarse facing may be sufficient to keep the entire heap open enough so that it is not necessary to remove the fines from the heap sand. A considerable saving of sand can be accomplished in this manner, but perhaps at a sacrifice of definite control over the heaps of backing sand. Where it is desired that the installation handle all of the sand in the foundry, it naturally must be quite elaborate, since conveying and handling equipment must be used for economy.

In addition to conveying and elevating equipment, an installation of this kind usually consists of a magnetic pulley to remove nails, wires and scrap metal; a crusher or lump breaker for breaking down the lumps of sand; a means of removing the foreign material and excess fines; a muller for rebonding the sand, and sometimes also an aerator after mulling. Just how far it is necessary to go will depend upon the requirements in the individual foundry. Where the installation is intended to handle only part of the sand for facing use, the installation can be fairly simple. Ordinarily, all that may be required is a means of removing efficiently the undesirable material and fines and rebonding the reclaimed sand.

With some simple method of feeding the sand to the reclaiming equipment, often all that is necessary is an efficient two-surface vibrating screen with a small bucket elevator or belt conveyor to give a uniform feed to the screen. With an efficient vibrating screen it is not necessary to use any other auxiliary equipment to help make the separation.

In some cases where floating dust is excessive, a dust collector may be found an advantage in order to make working conditions more pleasant. However, with a fully-enclosed, practically dust-proof type of screen, dust can be kept to a low point. For the average shop a simple installation of a screen and elevator can be fitted in to very good advantage, and it will be found highly profitable.

Reclamation Installations.

The purpose of a reclaiming installation is to recover usable sand from waste or refuse. Instead of discarding a large percentage of sand daily and replacing this with new sand, the usable sand from waste can be reclaimed and only the coarse material and fines rejected. A reclaiming installation can be comparatively simple. The tonnage of sand to be handled is not large and an expensive installation is not necessary. For most shops an efficient two-surface vibrating screen will be found most economical for recovering the good sand. A small bucket elevator with an economical means of conveying the sand to the mixer may be all that is required. If an overhead crane is available to transport the sand to the reclaiming installation, the problem is simplified.

Using a steel-encased elevator with a receiving hopper provided with a grating, the sand can be fed to the reclaiming unit by shovelling. The grating will hold back the larger lumps of sand, which can be broken down the back of a shovel. Some lumps are removed by the screen, which still contains good sand, but these can be returned to the unit, and will be further broken down so that all of the good sand eventually will be recovered.

A short belt feeder with a magnetic pulley may be an advantage, especially if there is any quantity of metal in the sand. For most reclaiming installations and the type of conserving installation used to prepare sand for facing, the object desired is to recover sand which can be used in the facing mixes. Where the tonnages to be reclaimed are small, a small two-surface screen may make a complete reclamation unit. In such cases the sand is fed to the screen by shovelling. The type of installation suitable for the individual foundry can only be determined after studying the requirement and knowing just how far it is desirable to go in connection with handling equipment.

(*Concluded on page* 274.)

Progress in Welsh Foundry Technical Developments.

The seventh annual meeting of the Wales, Monmouth and West of England Branch of the Institute of British Foundrymen was held at the Great Western Hotel, Cardiff, on October 4, and was well attended. Mr. R. J. Richardson, the newly-elected chairman, said he felt it a great pleasure and honour to take the chair as Branch-President, and he hoped the Branch would have a most successful year. This would only be possible by every member co-operating wholeheartedly with the Branch Council.

The Branch was ill-situated geographically, as the foundries in its area were scattered over an area west of Swansea and as far east as Gloucester, and yet, in spite of the bad times through which all were passing, the membership had increased by eleven during the year and now totalled 66.

Mr. Richardson's Address.

Mr. Richardson gave a *résumé* of the Papers given before the Branch during its previous session, making special mention of one given by Mr. Hird which had secured the Institute's diploma. Prof. Reed's Paper portrayed the method of manufacturing iron from primitive times right down to the present, and the Paper which followed by Mr. Beech at Bristol on "Continuous Casting" seemed almost like going from the ridiculous to the sublime.

Prof. Edwards's Paper had outlined most ably the manner in which gases occurred in metals and dealt with the all-important question of blowholes.

The next meeting held took the form of a discussion opened by Mr. W. R. D. Jones, which resulted in the holding of a great many meetings, at which the subject of training apprentices had been entered into thoroughly, and, after obtaining information from all sources possible, the education authorities were approached, and had resulted in a class having been arranged at the Cardiff Technical College. Twenty-six boys have arranged to take advantage of this opportunity. At Pontypridd a class has also been arranged, at which 16 boys attend.

The Paper given by Mr. Bennett, of Gloucester, was arranged at very short notice and was to be given again, and the last meeting of the session consisted of a visit to the works at Pontypridd, when the management explained their methods of steel production.

The President on Institutional Activities.

Mr. F. P. Wilson, President of the Institute of British Foundrymen, expressed his pleasure at being able to be present. This was his first official visit to any Branch, but it was not because this Branch had been the first to extend an invitation that he felt pleased to come. It was a pleasure and duty, because he realised the difficult times through which all had passed and also the scattered membership. The 300-mile journey had, therefore, been undertaken in the knowledge that new friends would be made—friends whom one is not likely to meet often owing to the distance which divides. Mr. Richardson had referred to the growth of the Branch, and it was a matter for congratulation that the Branch had now reached 66 in membership. The Middlesbrough Branch was about the same numerically, but was vastly different, because its members were not drawn from so large an area.

One point which was particularly worthy of note was that the Branch programme for last year, and also that for this year, contained a large number of Papers by members. This was a matter for congratulation, as it was more valuable to get Papers which might be amateurish if one could only get them from one's own members. It helped both members and Branch.

The Institute of British Foundrymen was not to be looked upon as strictly a society for debating abstruse problems. He liked to look upon its members as a collection of quite average men whose first object was to provide bread and butter and, if possible, a little jam. We realise that if the other fellow gets rather more jam than we do there is a reason. We are anxious to meet him and know the reason, and, generally speaking, foundrymen are sportsmen, and when they get together they are inclined to discuss matters in a very free and open way. All are individualists and know they are up against competition, and as long as they live they will be up against competition, which all must do their best to meet. This is where the Institute functions. Men can compare notes, and at other times experts can be called in who can tell of new methods and equipment, but one of the most important features of the Institute is its sociability. This is, perhaps, because the membership is so mixed. There are the owners, managers, chemists, moulders, patternmakers and others, and, like Toc H, rank is abandoned when one enters its ranks. Without wishing to sound irreverent, one might say there are Science, Skill and Sociability, and the greatest of these is Sociability. Without this sociability sweaters would be bred.

The Institute was deeply concerned about the young men growing up in the industry, and this Branch was to be congratulated upon the step it had taken. Middlesbrough was following along similar lines, and there they had a two years' course. It was a pleasure to see so many apprentices present at this meeting, added Mr. Wilson. They would appreciate the comradeship of their seniors. The Institute wanted these apprentices to know that it was deeply interested in their progress and education. It wanted them to know they had chosen one of the greatest professions. The foundry trade was one of the most skilled trades. Without moulders one could not build a house nor could one buy a decent suit.

The Institute desired the apprentices to remember that as a nation we were competing with nations who were doing all they could to produce skilled foundrymen. We do not look upon all as brilliant. All men must be useful. Brilliant men must rise. They cannot help it, but the plodder, too, may always rise.

Educational authorities were waking up to the fact that the foundry industry was a great industry, and it was to be hoped that the Cardiff apprentices would support the classes recently started. Something unusually attractive at the cinema might be a lure, but it would be well not to be attracted on Technical College nights. The Technical College did not pretend to make a skilled moulder, but it would help him to understand basic principles.

Industrial Test Matches.

Finally, Mr. Wilson said the Institute did want the boys to realise they were all in a team—an all-British team. Every day it played a test match against other countries, and this country needed a team which would do its very best right through. Perhaps a story would illustrate this point. There was a congregation belonging to a certain Roman Catholic church abroad which felt it would like to make a presentation to its priest on his birthday. They thought a cask of wine would be a good thing, and so decided each would bring a bottle of their very best wine and empty it into the cask outside the priest's bedroom on the night preceding his birthday. The following morning the cask was found to contain water! Each had thought the others were putting in of their best and so their contribution would not matter.

Mr. Wilson said he had been asked to conclude by presenting a diploma to Mr. S. Southcott in appreciation of his Paper on "Some Aspects of Jobbing Moulding."* These diplomas are not lightly given. Every Paper contributed was considered week by week, and the votes secured were aggregated. At the end of the session a diploma was awarded to that Paper which had secured the largest number of votes.

In accepting the diploma, Mr. Southcott said it gave him very much pleasure to give a Paper, and when one agreed to do something for the Institute one felt one must give of one's best, but nothing had been further from his mind than the award now made. He regretted his membership had been of so short a duration, as he could conscientiously say that he had learned more by attending meetings than he had done during the 28 to 30 years he had been in the industry. He would like to thank Mr. Bridgewater for making the drawings he had used in his Paper.

In thanking the President for his attendance, Mr. Hird said he hoped he would carry back pleasant memories of his visit to South Wales. He hoped the apprentices present would tell their friends how much they had had "rubbed in" that night. This "rubbing in" would continue, but it would always be a pleasant "rubbing in." When they did really understand the technical side of the industry there would be no question of dodging the lectures. Rather would they wish there were another night to attend. Apprentices should not be deterred by adverse criticism, but should make up their minds to gain as much knowledge as possible. He had much pleasure in proposing a very hearty vote of thanks to Mr. Wilson for his address and attendance at this meeting. Mr. W. S. Kinsman formally seconded this, and it was carried with acclamation.

In responding, Mr. Wilson said it had been one of the happiest of evenings, and he was pleased to meet Mr. Williams again. He had known Cardiff's new Director of Education for some time, and felt sure it was for Cardiff's benefit that Mr. Williams had been appointed. The classes at Middlesbrough had been arranged by Mr. Williams, and in him the Institute had a man who would support their endeavours. He hoped in turn the Branch would support Mr. Williams in anything he undertook on behalf of the industry.

The late Mr. J. Ellis.

Mr. McClelland, in a short speech, referred to the sad loss of Mr. Ellis, who had been of so material a value in the resuscitation of the Branch. The industry had lost a most faithful and honourable member.

Welsh Educational Developments.

The new Director of Education, Mr. W. Williams, said it was his first public appearance in Cardiff since his appointment, and he was very grateful to the Branch for affording him this opportunity, because if there was one industry he would desire to be connected with it would be that of the moulder. He left school at the age of 14, the son of a miner, who intended to put his boy to work less arduous than that in a mine, so he was put into the Dowlais office of Messrs. Guest, Keen & Nettlefolds. Here he moved about the works, and, as handicrafts had been his fetish, he had always felt the moulder had more opportunity of expressing his handicraft than had any other craftsman. The question of culture comes next, and generally the moulder is a man of culture.

It was a pleasure to meet again the President, as Mr. Wilson was a member of the Council Committee at Middlesbrough and had always been most punctilious in his attendances.

These were the days of mechanisation both of industry and thought, and he was pleased the

* Published in our issue of February 20, 1930, page 135.

(*Concluded on page* 274.)

Post-War Developments in International Business.

The Lancashire Branch of the Institute of British Foundrymen held its first meeting of the 1930-31 session in the School of Technology, Manchester, on October 4. The chair was taken by Mr. R. W. Stubbs (Branch-President), who said he desired to thank the Branch most sincerely for the honour they had conferred upon him by electing him President for the ensuing year. It was greatly appreciated, both by himself and his firm, the members of which had been long associated with the foundry trade and the Institute. He hoped he would be able to uphold the high traditions of the Lancashire Branch as worthily as they had been by his predecessors in office.

A Review of Present Industrial Conditions.

In the course of his address, a brief report of which appeared in our last issue, Mr. Stubbs said:—The conditions existing in the world before the war are, in many respects, similar to those existing to-day. Before the war, the world's capacity to produce was probably greater than the demand for the goods produced. The result was an increasing intensification of competition. Before the war this country was the greatest exporter of manufactured articles. It had secured markets, in the first place, and was able to keep these markets by the reliability of its products and the cutting of prices. When war broke out a first-class commercial crisis had become inevitable, due to the successful advance in our markets of America and Germany. The position to-day is similar.

Post-War Conditions.

Following on the war, with its enormous destruction of life and capital, there arose a contestation not only with the enemy nations but also amongst the Allies. The result was a commercial enmity, and we were faced with a new condition, with which we have not been in a position to cope. Added to this there were new States created, based on the strong sentiment of national feeling. This feeling found scope in industrial activity. Our Dominions and Colonies became, as a result of the war, active producers of goods not only for themselves but also in competition with us in foreign markets. And so, in competition, there arose a set of circumstances equal to, if not more difficult, than existed pre-war, whilst the productive capacity throughout the world has increased tremendously. Demand has also increased, but not in proportion to the increased productive capacity.

Whereas before the war we were the leading exporters, America now takes the lead. This country is second and Germany a very close third. America secured our markets during the war when we were unable to supply them. In addition, there is the incidence of taxation, to which reference will be made at a later stage.

If we were to succeed in reducing our prices below American and German prices, we might succeed in increasing our export trade, but we could only do so at the expense of the trade of other countries, and the inevitable result would be that they, too, would seek means of further depressing their costs. The endeavour of the newly-created States has been to become completely independent and self-contained, and, in order to protect and to encourage their native industries, they erect tariff barriers against the importation of foreign goods. It has seemed that the peoples of these countries have been more anxious to establish the independence and security of their countries than to secure for themselves what might be regarded as the British standard of living. Certainly wages and working conditions are less favourable in those countries, and the result is that they not only are safeguarding their own industries and are building up their States, but they succeed in defeating us in competition in the open markets of the world.

The Dominions and Colonies.

Prior to the war this country probably supplied the Dominions and Colonies with most of the requirements which they could not themselves produce. During the war the whole resources of this country were centred on the production of munitions and the successful prosecution of the war, with the result that we were unable to supply the Dominions with much that they needed and they had to turn elsewhere for the satisfaction of their demands or to produce for themselves what they needed. The only source to which they could turn for satisfaction from without was to America, and during the war America made great progress in our Dominions. The Dominions did, however, develop their own industries to a great extent, and since the war they have been enabled to do this by the immigration of first-class workpeople from this country.

Dominion markets are, in consequence, much restricted when compared with before the war, and there seems to be little reason to hope that we shall succeed in re-establishing our pre-war position. In point of fact, the Dominions have themselves erected tariff barriers against us so as to protect their growing industries.

Depreciation of Currencies.

Following on the war the currencies of all the European countries depreciated. This enabled them to compete successfully against us, and whereas now all currencies have been stabilised on a depreciated basis, these countries have written off a large proportion of their internal debts.

This country was for many years the only one which honoured its war debt and, in addition, a large percentage of the debt due to it has been written off. The result is that our competitors are greatly increased in number and in strength, and their costs are less. Our markets have been reduced to the extent of the increase of our competitors and our costs have been unduly increased due to our high taxation, high standard of living and our acknowledgment of our war-time liabilities.

Taxation.

The total taxation in this country amounts to over £800,000,000 per annum, working out at taxation per head of the population of £18 16s. The next highly-taxed country is the United States at £11 18s. per head of the population, and Germany, our other principal competitor, has a taxation per head of population of £8 10s. All taxation has to be met directly or indirectly by industry, and our industry starts at a disadvantage as compared with Germany to the extent of more than double the taxation.

An effort has recently been made to reduce the local taxation by the De-rating Act. The full extent of this relief cannot yet be ascertained, but it can be quite confidently anticipated that this relief will be practically nullified by the present Coal Mines Bill. On social services alone nearly £400,000,000 are spent each year in this country. It is true that the workpeople themselves contribute to this amount, but the bulk of the contribution is met directly by employers or by the State from Exchequer funds which are contributed by the taxpayers. So that, in addition to higher wages than in other countries, the workpeople in this country have the value of their wages still further increased by the most complete and generous system of social legislation in the world.

The following table is instructive as showing the comparative taxation in the principal countries of the world:—

Country.	Per head of population.	Index. (Britain=100.)
	£ s. d.	
Great Britain.. ..	18 16 0	100
U.S.A.	11 18 0	63
Germany	8 10 0	45
France	6 19 0	37
Switzerland	7 11 0	40
Belgium	5 2 0	28
Italy	4 0 0	21
Austria	7 16 0	41

Foreign Conditions.

In this country we secure a mass of information about conditions in foreign countries, but that information is in parts contradictory, and it is impossible to secure a comprehensive review of the wages, working conditions, costs and cost of living in those foreign countries. We know quite well that they are lower than in this country, but if we could secure precise and reliable information as to the exact conditions, then we would be better able to assess our position in relation to our competitors and thus determine the full extent of our disadvantage. This is a subject which should be very closely and specially investigated. The further difficulty in the matter of taxation also arises owing to the fact that the details of the systems in the various countries as compared with this country vary to such an extent.

Transport Costs.

A very important factor in the cost of living and in the cost of manufacture, and in the cost of export goods, is transport charges. Transport enters into the price of practically everything which is bought or sold. This country has to import the bulk of its raw materials, and they have to be conveyed first to this country and then by rail to factories in which they are to be treated either as finished articles or semi-manufactured articles. The semi-manufactured article is subject to further transport charges by rail, road or canal during further processes of manufacture. The manufactured article has to be conveyed by rail, road, canal or sea to the consumer, so that the minimum number of times that transport charges on any commodity require to be taken into account would appear to be four, and in a large number of cases it is more.

It is important to remember that the transport charge is a recurring one and a cumulative one, and transport costs seem to be one of the fundamental considerations in the cost of production. Taking as an example a ton of steel plates, it has been calculated that in the manufacture of steel plates to the delivery of those plates in an engineering shop, transport charges "in cumulo" represent at least 24 per cent. in the price paid by the purchaser. It would be well worth while to consider the possibility of taking such steps as are necessary to reduce transport charges. Our transport charges are much in excess of those of our competitors. The same remarks apply to dock charges and the handling of cargoes.

Reduction in Public Burdens.

The excessive load on local and imperial taxation borne by industry in this country has already been referred to. Recent legislative measures have increased this load still further, and there seems to be a greater prospect of a further increase than there is of a decline. There is a responsibility on Parliament and on municipalities to recognise that industry in this country is being strangled by excessive burdens.

Reorganisation of Industry.

Rationalisation is a term freely used at the present time. It is used in relation to the reorganisation of industry, but the manner of that reorganisation is left vague by the term, and a variety of conceptions exists. The intention points to the desirability of altering productive

capacity geographically so as to increase it in intensity by concentration. In some directions the impression exists that rationalisation would have the effect of reducing costs. In others the view seems to be held that higher prices could be secured for the commodities produced, and in other directions rationalisation is looked upon as a means of keeping up prices and if necessary of restricting output.

Rationalisation may generally be considered as meaning the merging of a number of productive plants. This entails the closing-down of some units, and if some firms are compelled to close down in whole or in part compensation will require to be paid. The question then arises whether this compensation is to be calculated on a cash or on a share basis. In any event the capital value of works so discontinued would become a liability and not an asset to the undertakings concerned. If compensation is paid in cash, however, there could be no question of compulsion about the disposal of money received, and there would be a grave danger that money at the moment held and available for industry in this country would be otherwise invested if not even sent abroad. At this stage it cannot be said that rationalised concerns have been universally and continuously successful, but neither can it be said whether this lack of success is due to rationalisation or to other causes.

Assuming that the object of rationalisation is the building-up of a large concern for the purpose of bulk and economic production, it has to be borne in mind that there is a limit to individual control. Nor could it be said that rationalisation as at present carried out has proved to be conducive to reductions in production costs. There is, further, the real danger of building up trusts and monopolies which will be to the disadvantage not only of the workpeople employed and the consumers of the goods, but to the country as a whole. The essence of trade and commerce is rational competition. In addition to the capital reorganisation and to the compensation involved there is a very large item in respect of stamp duty.

All that is said concerning rationalisation is at this stage theory; actual facts are not available, and it seems desirable that before any further progress is made in this direction the facts should be ascertained and disclosed. It might then be found that rationalisation is probably the least of the elements conducive to efficiency.

It should not be forgotten that in the course of evolution firms are constantly going through a process of improvement and adaptation in so far as they find it demanded and in so far as they can afford it. The essentials of improvement in industry are: (1) Reduction in costs of production; (2) reduction in costs of selling, and (3) reduction in selling prices. The main reason for depression in British industry to-day is the inability of British producers to compete with foreign makers both in home and oversea markets, and those three items require some analysis.

Reduction in Costs of Production.

The main factors in the cost of production are the cost of wages, fuel, light, power, heat, transport, rates and taxes, social services, depreciation, obsolescence, improvements in plant and equipment and organisation of works. The cost of fuel is determined, firstly, by the wages paid to the hewers of coal; secondly, by the ratio of profit required by the coalowners and by the royalty due to the landowner; thirdly, by the cost of transport to its various destinations, and fourthly, the cost of its distribution by coal merchants.

It may be that the mining industry, by greater mechanisation and otherwise, could be improved, and in consequence the cost of coal to the consumer, either industrial or domestic, reduced. Whether that is or is not the position it is not the purpose of these notes to discuss, but it is desirable that it should be clearly understood that the cost of coal is the bed-rock of all production cost. The cost of light, power and heat are influenced directly and largely by the cost of coal and transport.

As has already been shown, transport is an element of the greatest importance in production cost. There is no article nor any stage in the manufacture of any article that is not at some stage or stages subject to transport charges, and the cumulative load of transport charge on the finished article is a serious burden. The main means of transport are road, rail and sea. Rail, as a means of transport, depends on coal. Road to a great extent depends on rail for the transport of petrol and oil, which is the energy required by road transport. Transport by sea depends either on coal or oil for its propulsion, and here, again, coal is introduced as a very important factor.

Therefore, the very far-reaching effect of coal is clearly demonstrated, and these two considerations alone, if adequately dealt with, would give an immediate and cumulative relief. Again, it has already been shown that rates and taxes in this country are higher than in any country in the world. The main burden of this taxation falls directly or indirectly on industry. An immediate relief could well be secured if manufacturers were granted sufficient allowance in income tax for replacement and obsolescence.

Similarly, with the costs of social services, although the workpeople employed do make some contribution, the bulk of the contribution is met by industry or by industry through the Exchequer, and all these costs have to be met before the price of any finished article can be ascertained. Take, for example, the position of a finishing industry such as engineering. It works entirely with semi-manufactured articles, all of which bear in their price to the engineer the cost of fuel, light, power, heat, transport, taxation, social services, etc.

It is easy to visualise the cumulative effect throughout the various stages and processes of manufacture, and a close investigation into these items with the object of reducing their costs would be, it is suggested, more effective than any theoretical amalgamation or merger.

Reduction in Costs of Selling.

Salesmanship is now being recognised as an important factor in successful competition, and efforts are being made to institute the scientific training of salesmen. Complaints are frequently made that British manufacturers are not sufficiently interested in their own business to undertake expensive trips overseas for the purpose of interviewing existing or potential customers, and comparison is drawn with American and Continental manufacturers who are alleged to go into this question very much more seriously. It may be that sufficient attention is not paid to this aspect of the question, and that time, energy and money are wasted by not endeavouring to institute scientific methods of selling.

It has been suggested that the establishment of offices, warehouses and show rooms in different parts of the country and in different parts of the world is wasteful and serves no useful purpose. This may or may not be the case, but it certainly is the case that they add to the cost of production and to the ultimate selling price. The motor-car industry of this country is a very good example of the high cost of selling, but it is open to question whether firms could sell their cars any cheaper by instituting their own selling agencies.

Reduction in Selling Prices.

In considering the means for the reduction in selling prices, it is necessary to keep the following points in view:—(1) Improvements in the method of production, (2) improvement in plant and machinery, (3) reduction in public burdens, (4) cessation of burdensome legislation, (5) reduction in the costs of materials and transport and (6) contribution by foreigners selling goods in this country towards the cost of maintaining our home and colonial markets. All these are important items in the cost of any finished article and require consideration by themselves.

Improvement in the Method of Production.

It is frequently said that there is ample scope for improvement in the methods of production in this country. To what extent this is true it is difficult to say, but let it be admitted that there is room for improvement. The main consideration in securing these improvements is their cost, and no doubt many firms would to-day improve their methods if they could afford to do so, and if they could see a prospect of securing that amount of increased trade which would justify the expenditure.

But a large number of firms have so depleted their financial reserves in their efforts to maintain their position in the world markets, in their efforts to meet their obligations and to keep their operatives employed that they could not from their own resources contemplate any capital expenditure at this stage. On the other hand, there are firms who have brought their organisation completely up to date and who still are not in a position to compete with foreign countries, or suffer from the restricted world demand. In some cases it is definitely cheaper to maintain existing plant than to introduce new and up-to-date plant, purely because the output can be better handled by present methods.

Improvement in Plant and Machinery.

This again is a question of cost and of production. It is possible to call to mind works where machinery is most up to date, where supervision, shop organisation and costing are on the latest possible methods, and whereas these firms may be in a position to quote prices lower than their competitors in this country, they fail to secure contracts either at home or abroad. No firm would be justified in undertaking the capital expenditure necessary to re-equip its works unless it could see that it would be recompensed for this expenditure by increased output at a more remunerative price. The initial expenditure on new plant and machinery is heavy, and so speedily is the evolution of the machine tool and other mechanical devices taking place that to keep completely up to date a works would probably require capital expenditure each year in order to provide the latest equipment. This is clearly not a practical proposition at the moment.

It has already been stated that there is going on a constant process of improvement and adaptation where the circumstances justify it, but it is important to bear in mind that, despite the most complete equipment, firms are not always able to secure satisfactory prices for their commodities. Many municipalities, rather than pay the price for British goods, choose to go abroad and buy goods from countries where the wages and working conditions are so low as not to be tolerated in this country, and to this extent some municipalities are encouraging bad working conditions in other countries and doing their utmost, contrary to their best interests, to depress the working conditions in this country.

Cessation of Burdensome Legislation.

It does not seem to be properly appreciated that every measure of social legislation undertaken has an immediate reaction on the taxpayers, and every such reaction represents directly or indirectly an additional burden on industry and a decrease in national purchasing power. Industry's greatest need at the present time, if it is to make any attempt whatever to re-establish itself in the world markets, is, failing a lightening of the burdens of taxation, at least a clear and definite statement to the effect that on no account will an increase in taxation take place, at least until industry has had an opportunity to establish itself at the bed-rock

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of competitive efficiency. For this reason it would be of advantage for the Government at this stage to make a specific statement to the effect that it is prepared to call a halt to all additional burdens in taxation.

If it should happen that the purpose of the reorganisation is achieved and a trade revival set in, there would be an immediate and insistent demand for an advance in wages which would be difficult to refuse, notwithstanding a probable increase in the numbers of unemployed, but merely having regard to the increased volume of work and presumably the increased ratio of profit. An advance conceded under the circumstances would merely have the effect of again increasing the cost of production and negating any advantage of reorganisation.

Imagine the effect of a partial or even a complete reorganisation of the iron and steel industry. If it were reorganised in the most modern way and in the most rational way, it would cost in the first place a great deal of money, but even so it might be capable of producing cheaper iron and steel in so far as its own costs were concerned. But if the reorganised iron and steel industry has to pay a high price for coal due to uneconomic production and bad organisation, and if it has to pay unduly large transport charges due to similar causes, where then are the fruits of reorganisation? Then consider the processes which follow the manufacture of iron and steel. An engineer using iron and steel produced by the rationalised concern has to pay the existing high transport charges, the existing high coal and other charges, and any benefit at all contained in the price of steel as a result of the reorganisation of the steel industry is almost certain to be seriously affected by the other considerations.

The ramifications of industry in this country are great. No one industry is a complete whole —all depend on each other, and therefore before any benefit can accrue it is clear that reorganisation must be universal and that the process must start from the bottom. It should not be denied that in its fight for existence the industry of this country is capable of reorganisation and reconstruction, but the movement must be co-ordinated and carefully planned so that the result is for the good of the community as a whole, and wastage and leakage consequent upon intermittent and irrational organisation do not arise. Such a wholesale investigation and reconstruction of industry is not an undertaking appropriate to industry alone, to finance alone, to labour or to the Government. It is one which can only be achieved by the co-operation of all and by the full acknowledgment by all of their obligations and responsibilities. It is not a question of saving one industry, it is not a question of bolstering-up one industry; it is a question of saving the country, which is as much the concern of industry and commerce as it is of labour, finance and Government. The psychological effect of ten years' depression and unemployment on the mentality of the people is a consideration which requires the closest attention.

Conclusion.

The problem involved is not one which affects industry alone. It is a problem of national reorganisation affecting the general life of the nation. As such it should be carried on as a national movement, co-operative and co-ordinated in its conception and development, and not entered upon in detail until the whole position has been examined and a remedy outlined by the best brains in the country, free of any semblance of political or any other bias.

Vote of Thanks.

Mr. J. S G. Primrose moved a vote of thanks to Mr. Stubbs for his reasoned exposition of a national problem. The subject dealt with related not only to the foundry industry but also to every other trade in the country.

Mr. R. A. Miles, in seconding the motion, said he well remembered Mr. Stubbs presenting himself as a member of the Branch, and he was immediately earmarked as a future President. That event had happened, and they had listened to a most interesting address on a subject which was of vital importance to industry generally. It was not customary to criticise the address of a new President; all they could do was to receive it with pleasure and acclamation.

Mr. Gilpin, the Secretary, also added his expression of appreciation, and the resolution was carried with applause.

The Branch-President, responding, said he had read in The Foundry Trade Journal that morning that rationalisation in the German Steel Combine, after being in operation for two years, had resulted in an increase in the number of workers of 4 to 8 per cent., a decrease of clerks of 2 per cent., a decrease of directors of 25 per cent. He had also read that morning that the Director of the Iron Foundry Owners' Federation had confessed that rationalisation had proved a definite failure after two years of very careful working, and he explained it away by saying that they had borrowed money abroad at too high a rate of interest and that the whole of the benefit they had hoped to achieve from rationalisation had been discounted by the extra demands for money by the operatives. Those were two very different points of view. Which one were they to believe, and where was rationalisation going to lead to?

Local Activities.

It was announced that the Annual Dinner would not take place on February 14, as previously arranged, owing to the inability of the President of the Institute to be present, and that January 10 had been definitely fixed for the function.

The Branch-President appealed to the members to endeavour to induce apprentices to join the Junior Section, which, unfortunately, was very weak numerically as compared with the early stages of its existence. The Section was doing extremely good work, and that was evidenced by the fact that one of its members was clever enough to prepare and read a Paper before the Senior Branch. He trusted that managers and foremen would do all in their power to persuade apprentices under them to become members of the Section.

An interesting feature of the proceedings was the display by Mr. D. Rushworth (who is in charge of the Economiser Department of the Clay Cross Iron Company) and Mr. Eaves, of the Kodak Company, of a number of cinematograph films portraying the visit of the Branch to the works of the Clay Cross Company.

The President remarked that to have their exploits at a works visit described by means of the cinematograph was a unique event in the history of the Lancashire Branch. He sincerely hoped they would have more displays of a similar nature in the future.

Mr. E. Flowers moved a vote of thanks to the proprietors of the Clay Cross Company, to Mr. Rushworth and Mr. Eaves for the pleasant time they had on the occasion of the visit and for the cinematograph show that afternoon. Those who had an opportunity of taking part in the excursion regarded Mr. Rushworth as a personal friend, and he had provided the Branch, in the words of the President, with an experience which was unique.

Mr. Gilpin, in seconding the resolution, said the outing was one of the most pleasant he had ever had the privilege of taking part in. Everybody, including General Jackson and Capt. Underwood, went out of their way to give them a really enjoyable afternoon. He also wished to couple with the resolution Mr. Auckland's name.

Mr. Markland observed that the outing was, he hoped, only the beginning of better things to come, to which the President replied "It is."

Mr. Miles also expressed the view that the method of recording works visits they had witnessed that afternoon was remarkably interesting, and he hoped it would be repeated on many occasions.

The resolution was carried with acclamation.

Mr. Rushworth, returning thanks on behalf of the firm and Mr. Eaves, said they would be very pleased again to welcome the Branch if it was decided to visit other sections of the works.

The meeting on November 1 will take the form of a "Foundry Problem Night." Firms will be invited to submit in writing problems met with in the course of operations, and those will be discussed by the members. The solutions arrived at will be subsequently remitted to the firm, whose name will not be disclosed in any way.

Progress in Welsh Foundry Technical Developments.

(*Concluded from page* 271.)

moulders were given opportunities for discussion. There were guilds in the thirteenth century, and they were, doubtless, run on the same lines as now. It was not every craftsman who would admit there was room for education. The system of education came at a time when craft had been developed to a point and the Institute was accomplishing important educational work. The most important educational work may be done in the quiet of one's own room at home, and Mr. Williams said he would like to do all he could to encourage the moulders in their deliberations.

Mr. Williams spoke of the help given the Institute by Mr. Jones, in whom they had a good adviser, and it would be wise if those who lived in other University cities could find a man to help them as Mr. Jones was helping the Welsh Branch.

In proposing a vote of thanks to Mr. Williams, Mr. Fred Taylor, J.P., expressed his delight at being present, even though a late arrival, because he wanted to be present when Mr. Southcott received his diploma. He thought it would be an advantage to the Institute to have more Papers of the same type. At a recent meeting the Director of Education for Swansea (Mr. D. J. Rees) had said that education was something you learned after you left school when you had forgotten everything you had learned before. Mr. Williams had said much by way of encouragement, but many employers would be willing to pay the fees of their apprentices if only times were better. He was afraid the old type of craftsman was fast dying out owing to the stress and strain of the times and the fact that machinery was displacing so much labour.

Mr. R. G. Williams seconded the vote of thanks to Mr. Williams.

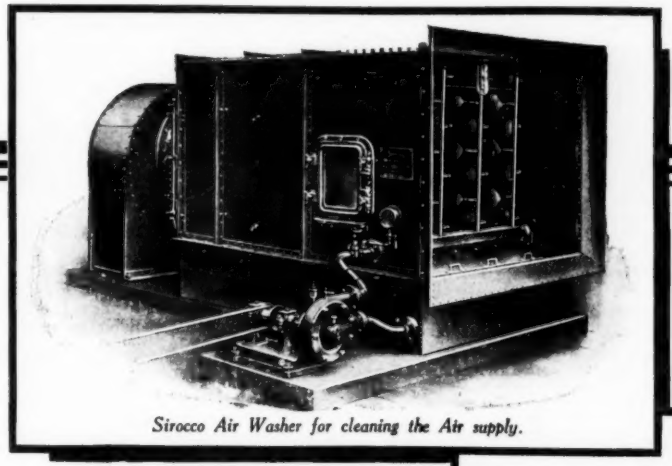
The speeches were interspersed with musical items provided by Mrs. Ethel Rawden and Messrs. E. Phillips, T. L. Wylde, W. J. Byard and R. J. Richardson, to whom a vote of thanks was proposed by Mr. W. Williams.

The Reclamation of Sand in Steel Foundries.

(*Concluded from page* 270.)

Conclusions.

The conclusions which can be drawn as a result of these tests and observations of more than fifty reclaiming installations are as follow: (1) That the efficiency of separation at the desired point is of utmost importance; (2) that a properly-reclaimed sand can be used to a very large extent as facing to replace new sand; (3) that, for a large percentage of steel foundries, a sand which passes a 20-mesh testing sieve and reclaimed on a 60- or 65-mesh sieve is most desirable; (4) that the most satisfactory use of reclaimed sand can only be obtained in combination with intelligent control of mixes; (5) that, with proper equipment, 50 per cent. to as high as 75 per cent. of former sand consumption can be saved; and (6) that a conserving or reclaiming installation can be simple, yet result in a maximum saving of sand.



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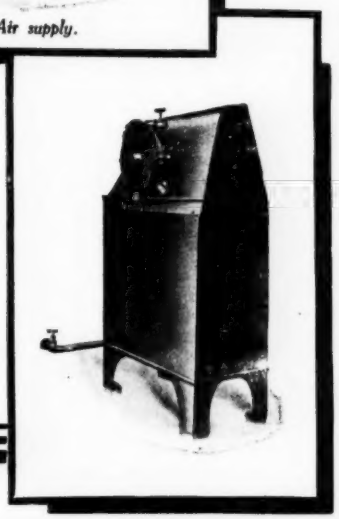

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Trade Talk.

The Hunslet Engine Company, Limited, Leeds, have purchased the goodwill of Messrs. Kerr, Stuart & Company, Limited, locomotive engine builders, of Stoke-on-Trent.

Messrs. Blackfriars Foundry Requisite Company, Limited, suppliers of foundry requisites and equipment, have moved into larger premises at 30, Norfolk Street, Strand, London, W.C.2.

Messrs. Cammell, Laird & Company, Limited, of Birkenhead, have launched the "Calder," the first of three single-screw cargo vessels which are being built to the order of the London Midland and Scottish Railway.

The South African business of Messrs. George Ellison, Limited, switchgear manufacturers, Birmingham, is being dealt with by Messrs. George Ellison (S.A.), Limited, at North British Buildings, Commissioner Street, Johannesburg.

A lantern and film lecture on "The Manufacture of Propellers" was given before the Institute of Marine Engineers by Mr. Wesley Lambert, of Messrs. J. Stone & Company, Limited, on Thursday, October 9, Mr. J. Hamilton Gibson presiding.

The single-screw steamer "Starling," built by the Ailsa Shipbuilding Company, Limited, Troon, for the General Steam Navigation Company, Limited, of London, has carried out official trials for speed and endurance, with very satisfactory results.

The annual dinner of the Institute of Marine Engineers has been postponed from the date previously announced, March 16, to Friday, April 17, 1931, at the Connaught Rooms, London, W.C.2. The change of date has been made necessary by the President's impending absence in South Africa.

Ten vessels, aggregating 26,894 tons, were launched from Clyde shipyards in September. This was the lowest output for any month this year. In the nine months of the year 154 vessels were launched of a total tonnage of 411,443. Only three contracts of any note were booked during September.

The Newark Engineering Society has arranged an interesting programme of lectures for the approaching session. The meetings will be addressed chiefly by local engineers; lectures will commence at 8 p.m., and will be limited to 45 minutes' duration in order to allow time for subsequent discussions.

An order for eight Garrett locomotives for the Kenya and Uganda Railway has been placed by the Crown Agents for the Colonies with the North British Locomotive Company, Limited, Springburn, Glasgow. This is equivalent to an order for sixteen locomotives, as the Garrett type is composed of two locomotives in one.

Messrs. David Brown & Sons (Huddersfield), Limited, gearing specialists, announce an amalgamation with Messrs. P. R. Jackson & Company, Limited, Salford. The companies will operate entirely independently as regards the execution of orders, but design will be standardised and the technical and research work will be available to the joint concerns.

The Vulcan Foundry, Limited, Newton-le-Willows, locomotive builders and ironfounders, has this year reached its centenary, having been established in 1830. The first two locomotive engines built were named the "Tayleur" and the "Stephenson," these being the names of the founders of the business. In August, 1864, the business was transferred to the present company.

The Clyde District Committee of the Boilermaker's Society are pressing for a decision on their claim for a minimum wage of £4 10s. per week for riveters engaged on piece work. The claim is that men are only earning £3 per week, the equivalent of the time rate, whereas they ought to receive a minimum of 50 per cent. higher than time workers. Over 4,000 men are affected, and the demand is for a settlement in the next few months.

The widespread pessimism prevailing throughout the country is partly to blame for the industrial position of the nation, was the contention of Mr. R. F. W. Nelson, managing director of Messrs. Hurst, Nelson & Company, Limited, when speaking at the company's annual meeting in Glasgow. Mr. Nelson condemned the action of many company chairmen who made pessimistic speeches. The position at his company's works to-day was satisfactory, and he hoped that by the New Year it would be still more so.

A civic week is being promoted by the Falkirk, Grangemouth and East Stirlingshire Publicity and Development Association, to be held from June 13 to June 20, 1931. It is proposed to stage an historical pageant representing the history of the town, and also to hold an industrial exhibition of Falkirk productions, with the object of showing the many varied specialities manufactured in the district, and to demonstrate the range of craftmanship available for the staffing of new industries which may be attracted to the district.

The Southern Railway Company has placed orders amounting to nearly £500,000 with the Metropolitan-Vickers Electrical Company, Limited, and the British Thomson-Houston Company, Limited, for the electrical equipment required for the trains to be employed in connection with the extension to Reigate, Brighton and Worthing of the company's electrified system, and also for certain additional trains to be provided to meet the increasing passenger traffic in the London suburban areas. These orders apply only to electrical equipment. The actual cars will be built in the Southern Railway's own workshops.

Messrs. Blair, Campbell & M'Lean, Limited, of Govan, Glasgow, iron and brass founders, have acquired the business of the Harvey Engineering Company, Limited, which is in liquidation, comprising all their drawings and patterns, and have also secured the services of some of the technical staff. The company will continue building Harvey equipment in their works at Govan. The firm will in future adopt the title Blairs, Limited, incorporating Messrs. Blair, Campbell & M'Lean, Limited, the Harvey Engineering Company, Limited (formerly M'Onie, Harvey & Company, Limited), and A. & P. M'Onie.

The engineering and shipbuilding unions on the Clyde are considering the abolition of overtime with the idea that the unemployment of members may be reduced. With a large number of unemployed men it is thought to be unfair to allow overtime, and it has been suggested that the employers' organisations should be approached for an agreement suspending overtime during the unemployment crisis. The Amalgamated Engineering Union, the National Union of Foundry Workers and other organisations connected with the metal trades are concerned. The patternmakers are taking a ballot of their members, and it is proposed that there should be a conference between their National Executive and the employers to arrive at some agreement for the modification of overtime.

Obituary.

Mr. P. F. Crinks, of the Metropolitan-Vickers Electrical Company, Limited, died on October 1, aged 51. Mr. Crinks was a pupil of Mr. H. Faraday Proctor, and later held several appointments on the engineering staff of the Bristol Corporation Electricity Department. He joined the British Westinghouse Electric & Manufacturing Company in 1910 and for several years represented them in the Western area. After being transferred to the London office of this company, he was appointed London sales manager for the Metropolitan-Vickers Electrical Company, Limited, and later managing director of Metro-Vick Supplies, Limited.

Dr. Daniel Adamson, the late President of the Institution of Mechanical Engineers and proprietor of Messrs. Joseph Adamson & Company, boiler and crane manufacturers, of Hyde, Cheshire, died at a Manchester nursing home last Saturday. Dr. Adamson was a grand-nephew of the pioneer of the Manchester Ship Canal, and was born in 1869. He was an authority upon numerous engineering subjects, including those of electric overhead-travelling cranes, the harnessing of waste heat from boilers and high-speed steels; a Paper on spur-gearing read by him before the Institution of Mechanical Engineers in 1916 gained the Hawksley gold medal; in 1926 he was awarded the Constantine gold medal by the Manchester Association of Engineers for a Paper on electric cranes. He joined the Institution of Mechanical Engineers in 1897; he was Vice-President from 1923 until 1929, when he became President. During his year of office he was invested with an honorary degree of Doctor of Science by the University of Manchester in recognition of his services to engineering. Dr. Adamson was a member of several technical societies, including French and American associations, and he attended several annual dinners of the Lancashire Branch of the Institute of British Foundrymen. In 1904 he became a partner in the firm of Messrs. Joseph Adamson & Company, and since 1925 had been its sole proprietor.

Personal.

The Earl of Crawford and Balcarres has succeeded Mr. J. Frater Taylor as chairman of the Lancashire Steel Corporation, Limited.

Mr. J. S. Nuttall, who until last July was chairman of Messrs. Platt Brothers & Company, Limited, textile machinery manufacturers, of Oldham, has resigned his seat on the board.

Mr. H. Bunting, the secretary of the East Midlands Branch of the Institute of British Foundrymen, has been appointed instructor of a class of foundry students attending the Nottingham University College.

Mr. P. B. Brown, managing director and deputy-chairman of Messrs. Hadfields, Limited, was installed as Master Cutler at Sheffield on October 7. The installation ceremony took place at the Sheffield Court House.

Mr. Stanley S. Cook, technical manager of the Parsons Marine Steam Turbine Company, Limited, has been elected a director of the company. Mr. W. H. Pilmour, secretary, has also been elected to a seat on the board.

Mr. James Hornby Jolly, secretary of Messrs. Guest, Keen & Nettlefolds, Limited, has been elected a director of the company. Mr. Jolly is also a director of Welsh Associated Collieries, Limited, and Messrs. John Garrington & Sons, Limited.

At a gathering of friends and officials at the Shotts Iron Works, Dr. Jacques, late chemist and manager of the by-products department, was presented with a smoker's outfit and umbrella on the occasion of his leaving the district. The presentation was made by Mr. A. B. Allison, ironworks manager.

Mr. Thomas Watson, until recently connected with the open-hearth furnaces under Messrs. Dorman, Long & Company, Limited, who is leaving Middlesbrough to take up an appointment in America, has received a presentation from his Middlesbrough friends. He came to that town as a chemist with Messrs. Bolckow, Vaughan & Company.

Mr. Herbert Southern, a director of Messrs. G. P. Wincott, Limited, Sheffield, who previously won the Vickers gold medal and prize and two other silver medals for Papers on the historical development, and the design and construction, of industrial furnaces, has been awarded the Gold Medal of the Junior Institution of Engineers for his Paper given in March last on "Industrial Chimneys and Flues."

Wills.

Findlay, C. J., of the Parkhead Boiler Works, Parkhead, Glasgow	£13,775
Ford, B., a director of Messrs. John Jackson & Company (Iron Merchants), Limited, of Kinning Park, Glasgow, and Langloan, Coatbridge	£15,632
Macgregor, J., chairman and managing director of Messrs. Johnson & Phillips, Limited, of Charlton, London, S.E.7, electrical engineers ...	£30,744

Reports and Dividends.

Parsons Marine Steam Turbine Company, Limited.—Profit, £20,525; brought in, £32,221; dividend of 10 per cent., tax free, £21,128; carried forward, £31,618.

Glenboig Union Fireclay Company, Limited.—Profit, £2,859; transferred from reserve, £5,000; brought in, £4,000; dividend of 2½ per cent., £2,906; carried forward, £3,235.

Steel Company of Scotland, Limited.—After crediting £36,772, being balance of workmen's accident compensation reserve left free for disposal, placing £12,500 to general reserve and providing £2,000 for contingencies incident to colliery operations, £198,956 is carried forward.

New Companies.

Speedy Metal Castings, Limited, 13-14, King Street, Cheapside, London, E.C.—Capital £100. Directors: Mona Cooper and A. L. Starling.

Scampton Foundry & Machine Company, Limited, Atlantic Works, Harefield Road, Coventry.—Capital £5,000. Directors: C. Scampton (permanent managing director) and Mrs. M. Scampton.

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Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—Uneventful will be perhaps the most appropriate term to apply to the existing conditions of the Cleveland iron trade, as evidenced by the persistent abstention from market attendance of both buyers and sellers, who now take but little interest in the limited volume of business submitted weekly, mostly to satisfy immediate requirements. The anticipated autumn expansion has not yet materialised, and ironmasters are well content if they can effect sales to correspond with the limited output, even this is difficult in the face of keen foreign competition. Continental iron is on offer at prices well below local quotations, and sales of Belgian pig for delivery on Tees-side are reported. Notwithstanding the difficulties of the present position, the Tees-side ironmasters resolutely decline to reduce prices. They are not embarrassed with very heavy stocks, and, as prices barely cover cost, no further cuts are contemplated. The minimum prices are therefore unchanged, as follow:—No. 1 Cleveland foundry iron, 66s. per ton; No. 3 G.M.B., 63s. 6d.; No. 4 foundry, 62s. 6d.; No. 4 forge iron, 62s. per ton.

An outstanding feature in the market for East Coast hematite is found in that a certain stabilisation of prices has been achieved and stocks are being reduced. This process has not gone far enough to justify any increase of output, but the gradual reduction of the financial burden represented by heavy unsold stocks is a welcome development which contributes to an improvement in the tone of the market. It may still be possible to cut 71s. per ton for mixed numbers, but that is the recognised market quotation, whilst No. 1 quality is quoted at 71s. 6d. per ton. On the North-West Coast Bessemer mixed numbers are again quoted 70s. per ton, at works.

LANCASHIRE.—In this area also, foundries, as a rule, are none too busy at the moment, but reports are favourable to the view that a fairly good average tonnage of pig is going into circulation. Prices are still without variation, both Staffordshire and Derbyshire No. 3 quality being quoted firm at 72s. per ton, with Scottish brands 92s. 6d. all per ton, delivered equal Manchester.

THE MIDLANDS.—The depression previously reported in markets for foundry pig in the South Staffordshire area continues without relief, and it is only occasionally that any transaction negotiated reaches the normal wholesale tonnage. Consumers are consequently bringing pressure to bear on the furnace owners for a reduction of prices, which they claim are inequitable in the face of existing conditions. So far, however, the appeal has had no effect upon quotations, which still rule as follow:—Northants No. 3, 70s.; North Staffordshire No. 3, 73s. 6d.; Derbyshire No. 3, 73s. 6d., with Scotch brands from 93s. 6d. to 97s., all per ton delivered local stations.

SCOTLAND.—Three more furnaces have been blown out, bringing the number operating in Scotland down to 10, six being on foundry iron and four on hematite. Whether this meagre output can be maintained remains to be seen, but there is certainly no doubt that business in Scotch pig-iron is at a very low ebb. There are no prospects of any improvement. The price of No. 3 foundry iron remains at the official minimum of 76s. 6d. at furnaces, with 2s. 6d. per ton extra for No. 1.

Finished Iron.

Business in the market for this class of material remains extremely dull, without any interesting feature, unless it is that the makers of Staffordshire marked bars continue to be fairly well occupied. The makers of crown and cheaper grades of iron are in a most unsatisfactory position, and are only able to get sufficient business to keep the mills going spasmodically. Marked bars remain unchanged at £12 10s. at works and crown bars are at between £10 and £10 5s. With regard to nut and bolt iron, this is quoted at about £9, but there are few transactions with which to test the market.

Steel.

At Sheffield buyers of acid billets are few, and in basic billets the dealings are chiefly in small lots of soft quality. The demand for hard basic billets has dwindled. Acid wire rods appear to be in slightly better request, but basic rods have to meet severe Continental competition. Prices are:—Billets, Siemens acid, £9 10s.; basic, soft, £6 10s.; medium, £7 12s. 6d.; hard, £8 2s. 6d. to £9 12s. 6d.; wire rods, acid, £12 5s. to £12 10s.; basic, soft, £8; medium hard, £9 15s. to £10; hard, £10 10s. to £11. The demand for finished steel has also been quiet, and the recent improvement in export business has not been maintained. At the same time, there is a fair amount of inquiry from some of the principal overseas markets. Prices in the tinplate market are again weaker, coke quality being quoted at 17s. basis, net cash, f.o.b. South Wales ports.

Scrap.

In the conditions now existing in industry generally, consumers of iron and steel scrap are themselves only irregularly employed in many instances, and are only needing reduced quantities of material. The outlook, moreover, is very uncertain, and there is evidence of a definite policy on the part of buyers to limit their purchases to small parcels for immediate needs. This is especially the case in the Cleveland area, where business is very quiet, and prices practically unchanged. In Yorkshire the quotation for heavy cast-iron scrap is again lower, but even at 52s. 6d. for ordinary and 55s. for machinery metal, both delivered, the demand is poor. In Scotland demand is also quiet, with machinery cast-iron scrap quoted 60s. to 62s. 6d., ordinary 55s., light metal 45s., and firebars 42s. 6d., all per ton delivered consumers' works.

Metals.

Copper.—The recent heavy fall in commodity prices has had, perhaps, less effect upon warrant copper values than others of the base metals, but even this section of the market weakened in the mid-week, while still above the low record reached a week or so ago. Reports are now current that further reductions in production are to be put in hand, but anything like a definite statement is lacking, and the standard market has not registered any serious indication of approval.

Closing quotations:—

Cash.—Thursday, £43 5s. to £43 6s. 3d.; Friday, £42 11s. 3d. to £42 12s. 6d.; Monday, £42 16s. 3d. to £42 17s. 6d.; Tuesday, £43 17s. 6d. to £44; Wednesday, £42 10s. to £42 12s. 6d.

Three Months. — Thursday, £43 5s. to £43 6s. 3d.; Friday, £42 11s. 3d. to £42 12s. 6d.; Monday, £42 16s. 3d. to £42 17s. 6d.; Tuesday, £43 17s. 6d. to £44; Wednesday, £42 11s. 3d. to £42 12s. 6d.

Tin.—The significant break in last week's standard tin prices, rumoured due to differences of opinion among the members of the producers' group, betokens, it is feared, a continuance of the existing slump conditions until there is a more pronounced revival of demand for the metal in world markets. Day after day persistent selling pressure has forced the market down, and although it is generally agreed that the position is oversold and liable to reaction, "bull" sentiment has been conspicuous by its absence and great nervousness prevails.

Official closing prices:—

Cash.—Thursday, £115 12s. 6d. to £115 17s. 6d.; Friday, £109 5s. to £109 10s.; Monday, £113 10s. to £113 15s.; Tuesday, £109 10s. to £109 15s.; Wednesday, £110 10s. to £110 12s. 6d.

Three Months.—Thursday, £117 5s. to £117 10s.; Friday, £110 15s. to £111; Monday, £114 15s. to £115; Tuesday, £111 to £111 5s.; Wednesday, £111 15s. to £111 17s. 6d.

Spelter.—In common with other metals, spelter has lost ground almost daily, but consumers have not displayed any great keenness in covering their requirements. High grade has been in rather better demand, but the outlook is far from good, and at the moment prospects of a recovery are lacking.

Daily fluctuations:—

Ordinary.—Thursday, £13 18s. 9d.; Friday, £14; Monday, £14 2s. 6d.; Tuesday, £14 3s. 9d.; Wednesday, £14 5s.

Lead.—The break in lead is now an accomplished fact, and for the present, at any rate, it seems that the Lead Producers' Association has ceased to support the market. By many lead is still held to be over valued and likely to fall lower.

The week's prices have been:—

Soft Foreign (Prompt).—Thursday, £15 5s.; Friday, £14 18s. 9d.; Monday, £15 2s. 6d.; Tuesday, £15 6s. 3d.; Wednesday, £15 7s. 6d.

Students' Corner.

Q.—What precautions should be taken, or what are the important points to remember, in connection with solid contraction?

A.—(1) That engineers, draughtsmen, patternmakers and all moulders, and especially designers should all recognise and consider the possibilities and variabilities in solid contraction, such as the following:—(*a*) that thin sections will contract quicker than thick sections; (*b*) that where a circle, square, or triangle forms part of a design, whether in a light or heavy casting, care must be exercised as to stays, ribs, etc., that form part of the casting tying up the outsides, which, due to the unbalancing of regular and uniform solid contraction, may quite easily distort or rupture the casting; (*c*) that very hard iron will contract more than very soft iron; (*d*) that ordinary solid contraction should not be retarded by any kind of obstacles such as stays, ribs or crossbars, in the attempt to prevent full contraction taking place. In all cases, freedom for contraction should be provided. If any attempt is made by which contraction is impeded, restricted, or retarded, a stress will be set up in the casting which may rupture at any moment. It must be remembered that contraction cannot be curtailed, or minimised, without setting up a stress, and such a stress becomes a real weakness. Plates, cast open-sand, whatever their shape, if of regular thickness, should always be well covered with sand as soon as possible after pouring. Neglect to do this often results in a crack developing sooner or later, especially on the outside of the plate, which cools first, and of course contracts first. A thicker covering of sand on the outsides of open-sand-cast plates will equalise the cooling, and therefore equalise the contraction. It must be understood there is a limit to dimensions in relation to thickness of plate castings, whether poured open-sand or covered, these limits are exceeded when the plate distorts or cracks. With many large circular plates which may have to carry a great weight, such as heavy loam tackle, the only hole cast in the plate would be 3 in. diameter for the sweeping spindle; it is wise for safety to split the plate on one side from the spindle cored hole to the outside by means of a flat plate thinly daubed with loam, provision being previously made for rails or steel plates, to span the opening and bolted together. The author has often taken this precaution, even with small tackle, as a safety-first measure, and has had the satisfaction, during a long career, of not having an accident through a cracked plate. Taking this precaution is well worth while, when it is considered that such plates are often in and out of the stoves, in high and low temperatures, and are very often subjected to moisture on the surface of the plate while in the stove during the drying and baking. Such a precaution also covers any slight margin of error in connection with the thickness of the plate, and the composition of the iron.

(To be continued.)

GREAT ECONOMY!

ONE of the greatest improvements you can introduce into your foundry is the STERLING ROLLED STEEL MOULDING BOX.

The result will be economy all round.

Your moulders will put down more moulds per day because STERLING BOXES are light and easy to handle;

You will be sure of an accurate product because STERLING BOXES are accurately made and maintain this accuracy permanently;

Your box maintenance costs will be at least halved because however heavy the service STERLINGS cannot crack or break.

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MOULDING BOXES
for every
FOUNDRY SERVICE

STERLING FOUNDRY SPECIALTIES LTD.

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13, VICTORIA STREET, S.W.1.

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Telephone: 3345 BEDFORD.
Telegrams: "STERFLASK, BEDFORD."
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Glasgow: ALBERT SMITH & CO., 60, St. Enoch Square, GLASGOW, C.1.
Newcastle-on-Tyne: LAWSON, WALTON & CO., LTD., Handyside Arcade, NEWCASTLE-ON-TYNE.
Manchester: F. L. HUNT & CO., Chapel Street, SALFORD, MANCHESTER.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	42	10	0
Three months	42	11	3
Electrolytic	46	5	0
Tough	44	15	0
Best selected	45	5	0
Sheets	75	0	0
India	58	0	0
Wire bars	47	10	0
Do. November	47	10	0
Do. January	47	10	0
Ingot bars	47	10	0
H.C. wire rods	49	0	0
Off. av. cash, September	46	6	$0\frac{27}{64}$
Do., 3 mths. September	46	6	$8\frac{25}{64}$
Do., Sttlmnt., September	46	6	$0\frac{1}{11}$
Do., Electro, September	50	1	$7\frac{1}{11}$
Do., B.S., September	49	7	6
Do., wire bars, September	50	13	$7\frac{7}{11}$
Solid drawn tubes			$11\frac{1}{2}$d.
Brazed tubes			$11\frac{1}{2}$d.
Wire			$7\frac{1}{2}$d.

BRASS.

Solid drawn tubes	10d.
Brazed tubes	12d.
Rods, drawn	$9\frac{1}{2}$d.
Rods, extd. or rlld.	9d.
Sheets to 10 w.g.	$8\frac{1}{2}$d.
Wire	$8\frac{1}{2}$d.
Rolled metal	$7\frac{1}{2}$d.
Yellow metal rods	6d.
Do. 4 × 4 Squares	$6\frac{1}{2}$d.
Do. 4 × 3 Sheets	$7\frac{1}{2}$d.

TIN.

	£	s.	d.
Standard cash	110	10	0
Three months	111	15	0
English	111	5	0
Bars	112	15	0
Straits	113	10	0
Australian	111	10	0
Eastern	116	0	0
Banca	113	10	0
Off. av. cash, September	132	14	$0\frac{9}{25}$
Do., 3 mths., September	134	6	$11\frac{5}{11}$
Do., Sttlmt., September	132	14	$1\frac{1}{11}$

SPELTER.

	£	s.	d.
Ordinary	14	5	0
Remelted	12	15	0
Hard	11	0	0
Electro 99.9	16	10	0
English	14	10	0
India	12	15	0
Zinc dust	20	0	0
Zinc ashes	3	10	0
Off. aver., September	15	18	$5\frac{13}{22}$
Aver., spot, September	15	15	$5\frac{9}{11}$

LEAD.

	£	s.	d.
Soft foreign ppt.	15	7	6
English	16	15	0
Off. average, September	17	17	$0\frac{23}{44}$
Average spot, September	17	18	$2\frac{5}{11}$

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	24	0	0
Do. V.M. ex-whf.	24	10	0
Rods	28	0	0
Boiler plates	20	0	0
Battery plates	21	0	0

ANTIMONY.

	£	s.	d.
Special brand, Eng.	36	0	0
Chinese	26	5	0
Crude	22	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver	22	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	£7 17 6
45/50%	£11 10 0
75%	£18 10 0
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% c. free	4/2 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	11½d. lb.
Ferro-phosphorus, 20/25%	£16 0 0
Ferro-tungsten—	
80/85%	2/3 lb.
Tungsten metal powder—	
98/99%	2/6 lb.
Ferro-chrome—	
2/4% car.	£30 10 0
4/6% car.	£23 5 0
6/8% car.	£22 7 6
8/10% car.	£22 0 0
Ferro-chrome—	
Max. 2% car.	£32 17 6
Max. 1% car.	£37 5 0
Max. 0.70% car.	£42 7 6
70%, carbon-free	11d. lb.
Nickel—99% cubes, or pellets	£175 0 0
Ferro-cobalt	9/7 lb.
Aluminium 98/99%	£95 0 0
Metallic chromium—	
96/98%	2/7 lb.
Ferro-manganese (net)—	
76/80% loose	£11 0 0 to £11 15 0
76/80% packed	£12 0 0 to £12 15 0
76/80% export	£10 10 0 to £11 0 0
Metallic manganese—	
94/96% carbonless	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 2
Finished bars, 18% tungsten	£0 3 0

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to $\frac{3}{16}$ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ½ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

South Wales—	£	s.	d.	£	s.	d.
Heavy steel	2	12	6 to	2	13	0
Bundled steel and shrngs.	2	7	6 to	2	10	0
Mixed iron and steel	2	5	0 to	2	7	6
Heavy cast iron				2	12	6
Good machinery for foundries				2	17	6

Cleveland—	£	s.	d.	£	s.	d.
Heavy steel				2	7	6
Steel turnings				1	17	6
Cast-iron borings				1	10	0
Heavy forge				3	5	0
W.I. piling scrap				2	17	6
Cast-iron scrap	2	12	6 to	2	15	0

Midlands—	£	s.	d.	£	s.	d.
Ord. cast-iron scrap	2	7	6 to	2	10	0
Heavy wrought	2	12	6 to	2	15	0
Steel turnings				1	7	6

Scotland—	£	s.	d.
Heavy steel	2	10	0
Ordinary cast iron	2	15	0
Engineers' turnings	1	16	6
Cast-iron borings	1	15	0
Wrought-iron piling	3	7	6
Heavy machinery	3	0	0

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	37	0	0
Brass	26	0	0
Lead (less usual draft)	12	10	0
Tea lead	10	0	0
Zinc	7	10	0
New aluminium cuttings	53	0	0
Braziery copper	34	0	0
Gunmetal	38	0	0
Hollow pewter	80	0	0
Shaped black pewter	60	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	66/-
Foundry No. 3	63/6
Foundry No. 4	62/6
Forge No. 4	62/-
Hematite No. 1	71/6
Hematite M/Nos.	71/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	79/6
,, d/d Birm.	88/6
Midlands—	
Staffs. common*	—
,, No. 4 forge*	68/6
,, No. 3 fdry.*	73/6
Shrops. basic	—
,, Cold blast, ord.	—
,, ,, roll iron	—
Northants forge*	65/-
,, fdry. No. 3*	70/-
Derbyshire forge*	68/6
,, fdry. No. 3*	73/6
,, basic*	—

*d/d Black Country dist.

Scotland—	
Foundry No. 1	79/-
,, No. 3	76/6
Hem. M/Nos.	77/-
Sheffield (d/d district)—	
Derby forge	63/6
,, fdry. No. 3	68/6
Lincs. forge	—
,, fdry. No. 3	70/-
E.C. hematite	83/6
W.C. hematite	86/6
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	67/-
,, fdry. No. 3	72/-
Staffs foundry No. 3	72/-
Dalzell, No. 3 (special)	105/- to 107/6
Summerlee, No. 3	92/6
Glengarnock, No. 3	—
Eglinton, No. 3	92/6
Gartsherrie, No. 3	92/6
Monkland, No. 3	92/6
Shotts, No. 3	92/6

FINISHED IRON AND STEEL.

Usual District deliveries for iron; deliveres consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	10	0	0 to	10	15	0
Nut and bolt iron				9	0	0
Hoops	10	15	0 to	12	0	0
Marked bars (Staffs) f.o.t.				12	10	0
Gas strip	10	15	0 to	12	0	0
Bolts and nuts, ¾ in. × 4 in.				15	5	0

Steel—	£	s.	d.	£	s.	d.
Ship plates	8	15	0 to	8	17	6
Boiler plts.	9	7	6 to	10	10	0
Chequer plts.				10	12	6
Angles				8	7	6
Tees				9	7	6
Joists				8	10	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ¾ in. (Untested)				7	15	0
				and upwards		
Flats—8 in. wide and over				8	12	6
,, under 8 in. and over 5in.				8	17	6
Rails, heavy				8	10	0
Fishplates				12	0	0
Hoops (Staffs)	9	5	0 to	9	15	0
Black sheets, 24g.	9	5	0 to	9	15	0
Galv.cor.shts., 24g.				11	12	6
Galv. fencing wire, 8g. plain				12	0	0
Billets, soft	5	15	0 to	6	5	0
Billets, hard	7	10	0 to	8	0	0
Sheet bars				5	15	0
Tin bars				5	15	0

PHOSPHOR BRONZE.

Per lb. basis.

Strip	1/-
Sheet to 10 w.g.	1/0½
Wire	1/0½
Rods	1/0½
Tubes	1/5¼
Castings	1/1

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	8d. to 1/2
Rolled—	
To 9 in. wide	1/2 to 1/8
To 12 in. wide	1/2½ to 1/8½
To 15 in. wide	1/2½ to 1/8½
To 18 in. wide	1/3 to 1/9
To 21 in. wide	1/3½ to 1/9½
To 25 in. wide	1/4 to 1/10
Ingots for spoons and forks	8d. to 1/4½
Ingots rolled to spoon size	11d. to 1/7½
Wire round—	
3/0 to 10 G.	1/5½ to 2/0½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	18.76
No. 2 foundry, Valley	17.50
No. 2 foundry, Birm.	14.00
Basic	18.76
Bessemer	19.76
Malleable	19.76
Grey forge	18.76
Ferro-mang. 80%	94.00
O.-h. rails, h'y, at mill	43.00
Billets	31.00
Sheet bars	31.00
Wire rods	36.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.65
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.70
Skelp, sheared steel	1.70
Steel hoops	1.95
Sheets, black No. 24	2.45
Sheets, galv., No. 24	3.00
Sheets, blue an'l'd, No. 13	2.15
Wire nails	2.00
Plain wire	2.30
Barbed wire, galv.	2.70
Tinplates, 100-lb. box	$5.25

COKE (at ovens).

Welsh foundry	26/- to 27/6
,, furnace	16/- to 20/-
Durham and Northumberland—	
,, foundry	14/6
,, furnace	15/- to 15/6
Midlands, foundry	—
,, furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box		17/-
,,	28×20 ,,		34/-
,,	20×10 ,,		24/6
,,	18¾×14 ,,		17/9
C.W.	20×14 ,,		15 6
,,	28×20 ,,		32 -
,,	20×10 ,,		23 6
,,	18¾×14 ,,		17/-
Terneplates	28×20		31/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0 to	£7	10	0
Bars, hammered, basis	£17	10	0 to	£18	10	0
Bars and nail-rods, rolled, basis	£15	17	6 to	£16	15	0
Blooms	£10	0	0 to	£12	0	0
Keg steel	£32	0	0 to	£33	0	0
Faggot steel	£20	0	0 to	£24	0	0
Bars and rods dead soft, steel	£11	0	0 to	£14	0	0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Over ½ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	62½%	47½%
Water ..	58½%	42½%
Steam ..	55%	37½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.		
Oct.	9 ..	43	5	0	dec.	6/3
,,	10 ..	42	11	3	,,	13/9
,,	13 ..	42	16	3	inc.	5/–
,,	14 ..	42	5	0	dec.	11/3
,,	15 ..	42	10	0	inc.	5/–

Electrolytic Copper.

		£	s.	d.		
Oct.	9 ..	46	10	0	No change	
,,	10 ..	46	10	0	,,	,,
,,	13 ..	46	5	0	dec.	5/–
,,	14 ..	46	5	0	No change	
,,	15 ..	46	5	0	,,	,,

Standard Tin (cash).

		£	s.	d.		
Oct.	9 ..	115	12	6	dec.	72/6
,,	10 ..	109	5	0	,,	127/6
,,	13 ..	113	10	0	inc.	85/–
,,	14 ..	109	10	0	dec.	80/–
,,	15 ..	110	10	0	inc.	20/–

Tin (English ingots).

		£	s.	d.		
Oct.	9 ..	116	15	0	dec.	70/–
,,	10 ..	110	5	0	,,	130/–
,,	13 ..	114	15	0	inc.	90/–
,,	14 ..	110	15	0	dec.	80/–
,,	15 ..	111	5	0	inc.	10/–

Zinc Sheets (English).

		£	s.	d.		
Oct.	9 ..	24	0	0	No	change
,,	10 ..	24	0	0	,,	,,
,,	13 ..	24	0	0	,,	,,
,,	14 ..	24	0	0	,,	,,
,,	15 ..	24	0	0	,,	,,

Spelter (ordinary).

		£	s.	d.		
Oct.	9 ..	13	18	9	dec.	2/6
,,	10 ..	14	0	0	inc.	1/3
,,	13 ..	14	2	6	,,	2/6
,,	14 ..	14	3	9	,,	1/3
,,	15 ..	14	5	0	,,	1/3

Lead (English).

		£	s.	d.		
Oct.	9 ..	16	15	0	dec.	10/–
,,	10 ..	16	10	0	,,	5/–
,,	13 ..	17	0	0	inc.	10/–
,,	14 ..	16	15	0	dec.	5/–
,,	15 ..	16	15	0	No change	

Exports of Iron Castings in September and the nine months 1930, compared with September and the nine months 1929.

	September, 1929.	September, 1930.	Nine months, 1929.	Nine months, 1930.	September, 1929.	September, 1930.	Nine months, 1929.	Nine months, 1930.
BUILDERS' CASTINGS—	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Stoves, grates, etc., cisterns, baths, etc., and cooking and washing boilers—								
To Argentine Republic	149	88	1,514	1,523	6,839	5,158	70,043	68,281
,, British South Africa	186	173	2,571	1,751	7,237	6,351	92,627	68,471
,, ,, India	84	100	1,216	1,143	3,471	3,666	47,342	42,138
,, Australia	51	7	542	243	2,882	468	30,785	14,130
,, New Zealand	112	63	1,043	763	6,722	3,863	64,721	44,863
,, Other Countries	754	785	7,471	7,583	36,033	34,686	343,241	341,151
Total	1,336	1,216	14,357	13,006	63,184	54,192	648,759	579,034
PIPES AND FITTINGS—CAST—								
To Argentine Republic	1,597	1,021	19,792	11,830	13,585	10,451	184,533	117,200
,, British South Africa	149	1,302	4,754	7,024	2,563	11,592	63,717	74,300
,, ,, India	176	110	3,373	2,286	3,083	2,012	46,159	35,623
,, Straits Settlements and Malay States	1,727	1,067	17,249	7,945	12,863	9,543	125,890	67,903
,, Ceylon	154	35	1,663	1,203	1,225	968	16,653	12,195
,, Australia	118	29	2,969	621	2,477	603	33,683	11,486
,, Other countries	8,178	4,220	49,601	59,136	89,380	53,789	595,799	675,444
Total	12,099	7,784	99,401	90,045	125,176	88,958	1,066,434	994,151
HOLLOW-WARE—								
Cast, not Enamelled, and Cast, Tinned	364	301	3,542	3,023	12,578	10,067	295,468	320,696
,, Enamelled	73	77	694	611	6,694	5,894	560,231	552,487
CASTINGS, in the rough—								
Iron	124	140	1,152	1,800	4,592	4,924	41,991	56,359
Steel	100	198	957	1,607	3,808	7,574	39,191	65,180

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